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Editorials.

ELECTION OF COUNCIL OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

ELSEWHERE in this issue will be found the results of the recent election to Council, and in view of the burning question concerning the proposed legislation which was put before the electorate, we would like to analyze it and see if we can read in it the general opinion of the profession on that point. Of the candidates, eight were avowedly "whole-hoggers" in support of the Draft Bill and included those gentlemen mainly responsible for the proposed Bill, viz., the President of the Council, and the Chairman of the Parliamentary Committee. The remaining three candidates had expressed themselves at various times as being not unfavourable to the main points of the Bill but opposed to the method of collection of the proposed Registration Fee, and on that ground would oppose the whole Bill. Now as to the result: seven of the retiring eight have been re-elected, including Professor Dewar, an opponent of the Bill well up the list, and accompanied by Mr. Rutherford, who at various meetings has voiced some opposition to the Bill. Two of the opponents to the Bill are in the last four on the list, therefore we are driven to the conclusion that the profession has pronounced itself as being clearly and distinctly favourable to the Bill. Were it not so the three might have been plumped for and might have headed the list. Sir John M'Fadyean at a meeting a little while ago emphatically announced himself as being wholeheartedly a supporter of the Bill, and he

heads the list with a large majority. In his case the figures may also be regarded as an expression of personal esteem, and of confidence in his conduct of the business of the Royal College during his tenure of office as President. But if it can be construed as a vote of confidence—and practically his last utterances to the profession before the election were absolutely in support of the proposed Bill, then it must of necessity be a vote of support of the Bill. The voice of the profession might possibly have been stronger in support. For example, the eight supporters might have been returned *en masse*. But that was not to be expected and scarcely to be desired, for it would have meant the exclusion of Professor Dewar, and we should have been very sorry for such an occurrence in spite of his views on this question. Moreover, we are not sorry to see the inclusion of Mr. Rutherford at the bottom of the list. We can recall previous elections at not very remote dates of gentlemen who disagreed with certain methods of procedure of the Council. When they arrived at Red Lion Square they found that circumstances were not quite what they had imagined, that other lines of procedure would be impracticable or less desirable than those in vogue, and consequently they modified their views and actions, much to their credit. We are glad to note that Mr. Rutherford did not issue an election address, and consequently he will arrive at Red Lion Square quite unfettered by election promises. If he desires to modify his opinions he can do so without reference to anybody, and we hope he may. Only one of the retiring members failed to be re-elected, and he took by no means a prominent part in the conduct of the proposed Bill.

All things considered, then, we are of opinion that the Council has received a clear mandate from the profession to proceed with the proposed Bill, which we hope they will do with as little delay as practicable.

THE INVESTIGATION OF SWINE FEVER.

WE would direct our readers attention to the abstract from the report by Drs. Dorset, M'Bryde and Niles of their investigations with the production of immunity against Swine Fever or Hog Cholera. It seems as though a protective serum will soon be a practical certainty. They have already been able to produce immunity lasting over three months by the simultaneous method of inoculation, and that is a very great stride. The regulations which are in force in great Britain for the control of Swine Fever by slaughter of diseased animals and the establishment of infected areas, assisted by the compulsory inoculation of all pigs within that area would, we believe, go far towards the solution of the difficulty experienced in all the vain attempts up to date to stamp out the disease.

General Articles.

MULE BREEDING.

BY J. D. BORTHWICK, M.R.C.V.S., CHIEF VETERINARY SURGEON, CAPE OF GOOD HOPE.

YEARS ago the Cape mule made a reputation in India as being the mule most suitable for military purposes, and during the late military operations in this country, when he competed with mules from all parts of the world, showed greatly to advantage over all comers for endurance and keeping his condition under trying circumstances.

As regards the market for mules, it has to be remembered that ox transport in this country is gradually being pushed off the road, and the mule is taking its place owing to the measures required to be taken to prevent the spread of cattle disease. Therefore the home market is not likely to be glutted for some time to come. The Indian market, too, would, if we produced a uniform type of mule, be open to us, so that the breeder need not be afraid of there being no market.

CLASS OF MULE.

There are three classes of mules, which may divided as follows:—

(1) The heavy draught mule, for draught work at docks, railways, and mines.

(2) The harness mule, for coaching, Cape cart, and other fast work.

(3) The general utility mule, for ploughing, transport, farmer's cart, and military or pack mule.

The breeder, having decided which class of mule he can rear with greatest advantage and profit, must then select his stud accordingly.

The remark frequently made that a mare which is not good enough to breed horses from would be all right to breed mules is very mislead-

ing, and only made in ignorance; a breeder of horses can by selection of sires go on improving his stock in shape and quality, but it is not so with the mule breeder who, having mated the Jack and mare, must for ever remain satisfied with the resulting mule.

Donkeys.

There are three principal breeds of donkey used for mule breeding, the Catalonian, Poitou, and Andalusian, and of those three the Catalonian stands out pre-eminent as a mule sire. Mr. Killgou, an American authority on mule breeding, states: "I risk nothing when I assert that no Jack in America has acquired celebrity as a mule breeder unless more or less partaking of Catalonian blood."

Catalonian Jackass.—The points which are looked for in a pure bred Catalonian Jack are:—

(1) Colour black, with whitish muzzle and belly, thin skin, and fine hair.

(2) Great courage, holding head high, straight action, and exceedingly active. A Jack, unless possessing courage, is useless as a mule sire.

In selecting a Jack, Spanish mule breeders always watch carefully the manner in which the Jack comes out of the stable; he should come out with head held high and a defiant look.

(3) Long ears.

(4) Height, 14 hands to 14·3.

(5) Bone below knee $7\frac{1}{2}$ in. to $8\frac{3}{4}$ in., hard, clean, and flat.

(6) Neck not too long, and must be thick.

Poitou Jack.—The Poitou Jack, bred in France, is black in colour, with long hair, standing 14·2 to 15·2 on short, thick legs, slow action, and with altogether a heavy, sleepy appearance.

Andalusian Jack.—The Andalusian is about the same type to look at as the Catalonian, but are all off colour, mostly grey, wanting in courage and action.

Mares—the Kind to Breed from.

As a mule partakes very largely in its size and shape from its dam, great care must be exercised in selecting the mares, they must be sound, well shaped, with a roomy middle, and of a good colour, black, bay, or brown preferably. The colour is a matter of no small importance, as it is most desirable to breed mules all of the same colour, which will considerably enhance their value when selling a team.

If the *heavy draught mule* is intended to be bred, then large, heavy mares, standing about 15·2, of the Clydesdale, Percheron, and Shire breeds are selected and mated with a Catalonian Jack standing about 14·3, thickly set and on short legs.

The *coaching mule* is bred from mares standing 15 hands, possessing Cleveland, Hackney, and sometimes Thoroughbred blood, the Jack used being 14 hands to 14·3, not too heavy in the body, but must be active and courageous. If a heavy-bodied Jack is used with mares, such as Clevelands, then the mule is too leggy and body too heavy, giving the mule a top-heavy appearance. Such a mule soon uses his legs and feet up.

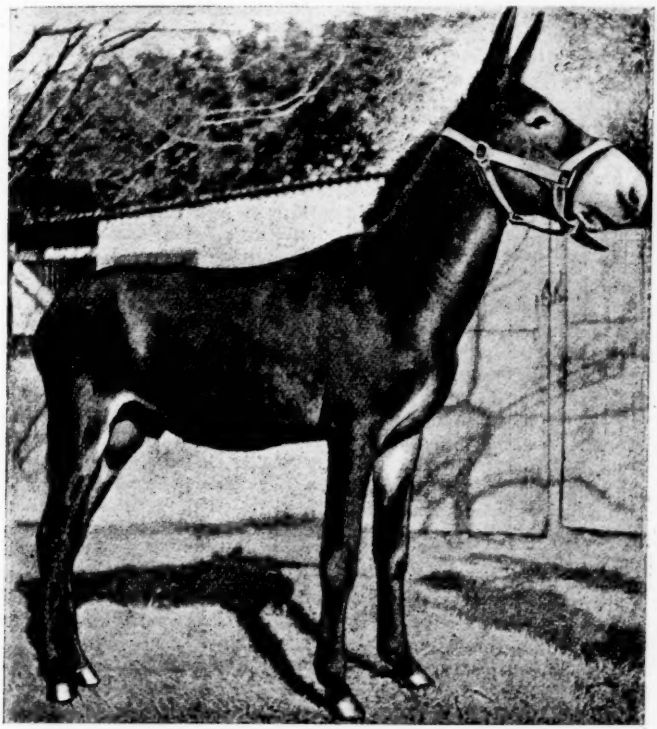
The *general utility mule*, and the one which I consider this Colony is able to produce most of, is got by mating good sound, well-bred roomy

mares, about 14·2 to 15 hands high, on short legs, and having good feet, the Jack being a pure Catalonian of about 14·2, thick set and active.

In selecting mares for whatever class of mule breeding, care should be taken to select them as much alike as possible, so as to produce mules uniform in colour, shape, and style, a well-matched team being of much more marketable value than a mixed lot.

Care and Use of the Jack.

A Jack is capable of serving forty to fifty mares during the season, and if well looked after, properly fed and exercised, he will still be of



Catalonian Jack, sire of heavy, coaching mules, &c.

use when he is twenty years old. I have seen Jacks in the Province of Catalonia over twenty years of age being used to serve mares, although they had to be assisted on to the mare. As there is no necessity for a mule breeder to change his sire as there is in the case of the horse breeder, it will readily be seen that the advantage of giving the Jack proper care and attention compensates for the original outlay of, say,

£125 to £175 which, under the condition of length of service, is cheaper than the horse-breeder's £500 thoroughbred.

The Jack should be provided with a clean, well-ventilated loose-box and a well-secured paddock for exercise, in which he can be turned loose in the daytime. Never allow him to run with donkeys. Keep him always in good condition. On no account allow him to get thin, and see that his feet get proper attention, so many being inclined to become club-footed.

The service of the mare should always be at the same place. The usual custom in Spain is to put the mare in a stall formed of a cross bar in front about the height of her chest, and two side poles extending back to about her quarters, with a slope to about 2 ft. from the ground; side lines are then put on, and the mare is ready for service. The Jack is then brought to the mare, but not allowed to mount until he is ready. It must be remembered that a Jack takes longer to get ready, and patience must be exercised; many good Jacks are spoilt through the want of a little care. Jacks have been known to refuse serving for a whole season through having been kicked. Some Jacks, especially old ones, have a habit of biting the mares severely, and in those cases a net muzzle should be worn. If the mares are unbroken, then a pony stallion should be used to try which mares are in season, and these driven into a small kraal; but it is most desirable to handle the mares sufficiently at all events to make them halter broke.

Having selected and mated the sire and dam, the breeder then looks forward to the appearance of the mule, whose shape, style, and quality will reveal the breeder's judgment. At this stage it must be seen that the dam gets sufficient food to provide a good supply of milk for her mule, which must be highly nourished to be able to grow out; in fact, care must be taken until such time as the mule is disposed of that he is kept in good condition. It is next to impossible to sell a thin mule, whilst fat ones command their full value, which will compensate for their feeding. The mules should be weaned when about 7 months old, and placed in a camp with a quiet old mare, preferably a grey one, as companion. The mules soon become attached to the mare, which helps to keep them quiet. The mules should be periodically kraaled, to prevent them becoming wild, so that when they require to be broken, it becomes an easy matter if done with patience and kindness. It must always be remembered that a mule is not a natural animal, but is rather the invention of man, and has been aptly described as an "animal with no ancestry and no hope of posterity."

Whilst he is a "natural puller," he has enormous strength, which he is loth to make use of, but if given a lead he exerts himself to his very utmost. The Spaniards, recognizing this, nearly always have a horse, or, better still, a grey mare, to lead their teams.

(*Agricultural Journal, Cape of Good Hope.*)

THE PRODUCTION OF IMMUNITY FROM HOG CHOLERA.[1]

BY M. DORSET, M.D., C. N. McBOYDE, M.D., AND W. B. NILES, D.V.M.

In a previous publication from this Bureau it has been shown that the disease known as hog cholera, encountered in epizootic form in Iowa and other parts of the United States, is caused by a filterable and probably ultramicroscopic virus which exists in the blood of sick hogs, and that *Bacillus choleræ suis*, although present in most cases of hog cholera, in all likelihood plays the part of a secondary invader. This modification of our views regarding the etiology of hog cholera necessarily carried with it changes in plans for combating the disease.

Most of the methods for combating the disease which have heretofore been proposed were very naturally based upon the general belief that *B. choleræ suis* was the cause of hog cholera, and many different methods of preparing vaccines and antitoxic sera through the use of that organism were devised and subjected to extensive laboratory as well as practical tests. Although a certain degree of success was apparently attained in some instances, none of these methods have been found to act with sufficient reliability to warrant their use in practice.

In the case of vaccines prepared from cultures of *B. choleræ suis* a certain amount of immunity against that organism may have been at times induced in the treated hogs, and a similar result may have been secured by the administration of antitoxins prepared through the use of the same organism, for in the earlier publication above referred to it has been shown that *B. choleræ suis* usually invades the body of the hog after injection with the filterable virus, and, as stated there, it is reasonable to believe that the final result of the disease is in many cases materially influenced by the presence of that organism. Any vaccine or serum which protects against *B. choleræ suis* would therefore be expected to aid the body in its struggle against the twofold invasion of filterable virus and *B. choleræ suis*. We believe that the partial success attained at times by the use of sera and vaccines prepared from *B. choleræ suis* is to be explained upon this ground.

In view of the fact, however, that the filterable virus is the primary invader, and that it appears to be quite sufficient in itself to cause the death of most hogs, any substance which protects only from *B. choleræ suis* must necessarily be regarded simply as a palliative, which, in the light of past experiences, is without a value that is in any way commensurate with the cost of applying it.

It thus seems evident that all efforts looking to the prevention or treatment of hog cholera should be directed primarily toward securing some means of protecting the hog from invasion by the filterable virus, or of overcoming that virus if invasion has already taken place.

Since it was first definitely determined that *B. choleræ suis* is not the primary cause of hog cholera the work of the Bureau of Animal Industry has been along the lines just suggested. Much difficulty has been experienced in carrying out this work, due in great measure to our inability to cultivate the filterable virus artificially, and to the fact that of all animals exposed to this virus only hogs have proven susceptible. We have thus been restricted to the use of the blood

[1] Abstracted from Bulletin 102, Bureau of Animal Industry.

and tissues of sick hogs in our attempt to secure a satisfactory serum or vaccine.

As stated in Circular 43 of this Bureau, issued February 12, 1904, "the basis of the immunity experiments, therefore, has been the use of attenuated and disease-producing liquid or dried blood, or the use of this blood mixed with blood obtained from immune animals, in which animals the immunity has been increased by the injection of large doses of disease-producing blood obtained from hogs known to have the disease; or, in other words, disease-producing blood and antitoxic blood separate and combined have been successfully used."

The efforts to attenuate the virus in blood from diseased hogs by drying, by heat, and by chemical agents have not led to satisfactory results. This appears to be due in part at least to the unequal resistance of the virus in different lots of diseased blood to these agencies. At times the protection afforded by diseased blood attenuated artificially has appeared to be complete; at others a vaccine prepared in identically the same manner has either caused death, thus showing an entire lack of attenuation, or else the hogs have shown no ill-effects from the vaccination, but have succumbed promptly when exposed to hog cholera, showing that the supposed vaccine had no protective power whatever.

It may be that later investigations will show that it is possible to obtain a satisfactory vaccine for hog cholera by attenuating the virus, but our own results were so discouraging that efforts in this direction were abandoned and our entire attention turned to the production of a serum.

It will be remembered that in the experiments of 1903 and 1904 the immune blood protected the treated animals from the disease-producing blood which was administered simultaneously with it, but some of the vaccinated animals succumbed when exposed to hog cholera about thirty days later. The most rational explanation of this occurrence appeared to lie in the supposition that too much immune blood was administered with the diseased blood. The animals would thus be completely protected from the simultaneous injection of the virus, but owing to this complete protection from the virus the animal body would have no stimulus to bring about a reaction and a consequent production of an active immunity which was aimed at by the simultaneous method of vaccination. Under such circumstances it seemed reasonable to suppose that the vaccinated hogs possessed only a passive and transitory immunity, such as might be expected from the injection of an antitoxin.

In the experiments of 1905 we were unable to clear up this point, owing to difficulties experienced in securing suitable material for the work. The experiments were greatly delayed, and it was only possible to carry out those which have just been described. Inasmuch as no hogs were injected with the immune serum alone in these experiments, the question as to the nature of the immunity afforded by our injections could not be definitely determined. There is reason to believe, however, that this may have been due to the serum alone, at least in the case of those which received 20 cc. of immune serum, while there can be no doubt that the two hogs 1,397 and 1,398, which became sick, but recovered, secured an active immunity. It is entirely possible that the other hogs which received 10 cc. of immune blood with the disease-

producing blood suffered a very mild attack of disease, and thus secured an active, permanent immunity. It would be natural to suppose, however, that if 10 cc. of immune serum gave sufficient protection from the disease-producing blood to prevent any outward manifestation of disease the protection afforded by 20 cc. would be complete, and that subsequent immunity in these hogs would presumably be due to the immune blood alone.

Experiments of 1906.

The experiments show quite clearly that blood from certain hyper-immunized immunes possesses the power to protect non-immune hogs from a fatal dose of disease-producing blood administered simultaneously with the serum. It has also been shown that hogs which survive a simultaneous injection of serum and disease-producing blood are rendered immune for at least twenty-five days thereafter, even though they show no reaction after the injection. Notwithstanding the success which attended most of these experiments, many questions affecting the practicability of this method for combating hog cholera yet remained undetermined. In conducting the experiments during the year 1906, therefore, we have endeavoured to decide, in so far as time and material would permit, these other questions in connection with experiments designed to substantiate the results already obtained.

Plan of the Experiments.

The experiments which are to be described hereafter will perhaps be best understood by indicating the general plan which was followed. The questions to be decided concerned first, the immunes, and second, the hogs that were to be vaccinated.

Questions concerning the Immunes.—Without attempting to go into the plans in detail, the 1906 experiments may be said to have had the following objects in view: To determine (1) whether natural immunes or those which have acquired immunity are best suited for serum production; (2) what percentage of either natural or acquired immunes may be expected to yield a potent serum; (3) whether the "quick method" or the "slow method" of hyper-immunization yields the best results; (4) whether disease-producing blood from different outbreaks of hog cholera is equally well suited for the purposes of hyper-immunization; (5) whether the amounts of disease-producing blood used for hyper-immunization might be reduced without affecting the potency of the serum, and (6) how long after the last injection with disease-producing blood the immunes retain the power to furnish a potent serum.

Questions concerning Vaccination.—Many questions arise in connection with the practical application of the serum, but it has not thus far been possible to attempt to answer all of them. The principal points we had in mind during the 1906 experiments were as follows: To determine (1) the dose of serum required to protect a small hog (25 to 50 lb.) from a simultaneous injection of a fatal dose of disease-producing blood; (2) the duration of the immunity which follows this simultaneous injection; (3) whether it is necessary to produce a reaction (*i.e.*, visible illness or fever, or both) in order to secure a lasting immunity; (4) whether the administration of sufficient serum to prevent a reaction will tend to shorten the duration of the immunity

in vaccinated hogs; (5) whether hogs vaccinated by a simultaneous injection of serum and disease-producing blood are likely to be injured or stunted in growth; (6) whether hogs vaccinated by this "serum-simultaneous" method may communicate hog cholera to unvaccinated hogs by association with them; (7) whether a lasting immunity may be produced by the injection of the serum alone; (8) whether the serum alone can be used successfully as a cure; (9) how long the serum will retain its potency; and (10) whether satisfactory results may be obtained by vaccinating suckling pigs.

General Plan for the Production of Serum in 1906.

The Immunes Used.—Eight immune hogs were to be hyper-immunized. If possible, four of these were to be hogs that had acquired immunity, while the remainder were to be natural immunes. Four of these eight hogs (two natural immunes, and two that possessed acquired immunity) were to be hyper-immunized by the use of one strain of disease, while the remaining four were to be given disease-producing blood from an entirely different source.

Method of Hyper-immunization.—There were certain general features in the process of immunization which applied alike to all immunes treated by the same method. First of all, in order to make sure of a firm immunity and to avoid losses later, a preliminary injection of 20 cc. of disease-producing blood was given each immune. After this the regular process of hyper-immunization was begun. Four of the immunes were hyperimmunized by the quick method and four by the slow method described under the 1905 experiments.

The immunes treated by the quick method were injected with one dose of disease-producing blood, the amount administered being equal to 1,000 cc. of disease-producing blood to each 100 lb. of body weight. Exactly three weeks after this injection blood was drawn from the tails of these immunes and preserved for experimental use. This blood drawing from the immunes was repeated at intervals of seven or eight days until three drawings had been made, and in most cases, as shown by the detailed records which follow, a fourth drawing was made approximately a month after the third drawing.

The immunes treated by the slow method were injected three times. The first dose was in the proportion of 100 cc. of disease-producing blood to 100 lb. of body weight; the second dose, which followed the first after from ten to fourteen days, was in the proportion of 250 cc. per 100 lb. body weight, and the third and last dose, which was given approximately twelve days after the second, was in the proportion of 500 cc. per 100 lb. of body weight. Blood drawings from the immunes hyper-immunized by the slow method were begun nine or ten days after the last injection of disease-producing blood, and repeated at intervals of seven days.

The object of these repeated blood drawings from the immunes was of course to secure blood for the purpose of ascertaining how long after the last injection of disease-producing blood the immunes retained the power to furnish potent serum. These different drawings of immune blood—that is, some of them—were tested on non-immune hogs, as shown in the experiments hereinafter described.

Method of Collecting and Preserving the Immune Blood.—The immune blood was drawn in all cases from the tails of the immunes, and was

collected in a wide sterilized dish. It was allowed to coagulate, and the clot which formed was then subjected to pressure in order that all of the serum might be separated from it. Instead of a clear serum, therefore, we secured always a serum containing large numbers of red blood corpuscles, and which might be more properly called defibrinated blood. The time required for the red cells to settle and the very considerable loss of serum which would have resulted if we had attempted to use clear serum only, owing to lack of facilities for using a large centrifuge, made it necessary to employ the serum containing red cells. In applying a similar method to cattle the use of a serum containing red cells would no doubt be considered objectionable, owing to the danger of transmitting some intercurrent disease, such as Texas fever, through such injections. Such contingencies were not likely to occur in the case of hogs, however, and, furthermore, any possible danger of this kind was no doubt avoided through the addition of an antiseptic to the serum immediately after it was drawn. After the serum had been completely separated from the clot by pressure and by straining through a sterilized cloth it was mixed with a 5 per cent. aqueous solution of carbolic acid in the proportion of nine parts of serum to one of carbolic acid solution, thus giving a 0·5 per cent. solution of carbolic acid in the serum. This served to keep the serum perfectly, provided it was placed at once in sterilized bottles until used. It should be remembered that all of the hyper-immune serum used in the experiments described hereafter consisted, in reality, of one part of carbolic acid solution and nine parts of serum and red cells.

Sources of Disease-producing Blood, with Details of the Hyper-immunization.—As already stated, disease-producing blood from two entirely distinct sources was used for the treatment of the immunes. One of these strains of disease was obtained near Scribner, Nebraska, and is referred to as the "Scribner disease." The other strain of disease was secured near Alexandria, Virginia, and has been designated the "Syphax disease." Blood from both of these sources proved quite virulent when administered to non-immune hogs, the blood from the Scribner outbreak, however, appeared to produce a somewhat more acute type of disease than the blood from the Syphax outbreak. The immunes hyper-immunized with blood from the Scribner outbreak are designated "Scribner immunes," and, depending upon the method used for hyper-immunization, the individuals have been called "Scribner quick immunes" or "Scribner slow immunes," as the case might be. The same plan is followed in speaking of the "Syphax immunes."

Summary of Experiments with First Drawing of Serum from Immune 1,310.

Results of Vaccination.—Eighteen hogs were vaccinated by the serum-simultaneous method; of these ten received 10 cc. or less of serum, while the remaining eight received 15 cc. or more of serum. Eight out of the first ten became sick, and six died, as a result of vaccination, while none of the eight hogs that received larger doses of serum became sick. Four hogs that were injected with disease-producing blood alone died of hog cholera as a result of the injection. The eight hogs that were injected with serum alone as usual remained well. All pen checks with vaccinated hogs remained well,

notwithstanding the fact that some were exposed to hogs that died as a result of vaccination.

Results of Exposure to Hog Cholera.—Twelve hogs treated by the serum-simultaneous method were exposed to hog cholera after vaccination, some being exposed after an interval of twenty-four days, while others were not exposed until approximately two and a half months after vaccination. Of these hogs only two had shown symptoms of sickness after vaccination. None of the twelve became sick as a result of exposure. Eight hogs that had been treated with serum alone were exposed to hog cholera, four being exposed eighteen days after vaccination, and four two months and eighteen days after vaccination; six of these died of hog cholera. Five unvaccinated hogs were exposed with the treated hogs as checks, and all of those died of hog cholera.

From these experiments we may conclude that—

(1) The serum from hog 1,310, first drawing, will, when given in sufficient dose, protect hogs from a fatal dose of disease-producing blood administered simultaneously with the serum.

(2) This simultaneous vaccination confers on the treated hogs an immunity which lasts for *at least* two and a half months.

(3) The immunity in hogs which showed no symptoms after vaccination seems to be quite as firm as in those that were made visibly ill.

(4) Serum alone did not confer a satisfactory immunity for even three weeks in the dose used.

(5) The immunity in serum-simultaneous hogs was not due to the action of the serum alone.

(6) Check hogs exposed to hogs which became sick as a result of vaccination contracted disease from them in some cases.

Summary of Results obtained with Serum from Non-hyper-immunized Immunes.

Serum from two immunes was used in doses of from 5 cc. to 20 cc., and this serum was injected into non-immunes simultaneously with a fatal dose of disease-producing blood. Ten were treated by this process; all contracted hog cholera, and eight died of that disease. Of four hogs injected with disease-producing blood alone, all died of hog cholera. Five checks were placed in the pens with the vaccinated hogs, and all contracted disease from them and died. The two pen checks exposed in the pen with the hogs that received disease-producing blood only also died of hog cholera.

From the results stated above, it will be seen that (1) the protection afforded to non-immune hogs by the injection of serum from non-hyper-immunized immunes is very slight as compared with that afforded by hyper-immune serum; (2) even in doses of 20 cc. the protection afforded was not sufficient to prevent the death of one of the two animals that received that dose; (3) the contagiousness of the disease is not noticeably lessened by the injection of serum from a non-hyper-immunized immune; and (4) the serum from non-hyper-immunized immunes is not potent enough to render its use practicable in combating hog cholera.

Two experiments which were designed to throw some light upon this question have been carried out, but before proceeding to a description of these a few words should be said concerning the way

in which the hogs used in these experiments were exposed to infection.

In vaccinating hogs by the serum-simultaneous method, it will be remembered, the method of introducing the infection consisted in the injection of the hogs subcutaneously with a fatal dose of disease-producing blood. The same end might have been attained by allowing the hogs which were to be vaccinated to associate with sick hogs, but owing to the uncertainty as to the exact time when infection would take place by mere association, and also because such a method would not be suitable for practical use, the blood-injection method of infection was used exclusively in the immunization work.

It will be understood, however, that in testing the curative power of a serum it is very desirable to carry out the experiments with animals under natural conditions as nearly as possible. For this reason, and also in order that we might compare results, one of the experiments to test the curative value of hyper-immune serum was carried out with hogs that had been exposed to infection by association simply, while in the other experiments hogs that had been infected through disease-producing blood injections were used.

Discussion of Curative Action of Immune Serum.

Earlier experiments have shown that the serum from hyper-immunized immunes, when given in sufficient dose, may be expected to protect non-immune hogs from a simultaneous infection with hog cholera, and two experiments show that this serum may also be expected to prevent the death of hogs when it is administered in moderate doses within four days after infection actually takes place. Later than this it is probable that the serum in virulent attacks of hog cholera will do little good, even though comparatively large doses are given. For this reason it seems possible that serum from immunes prepared in the manner described in this paper may not prove suitable for general use as a curative agent for hog cholera, although in cases where the disease is recognized soon after its appearance in a herd the serum would probably save many hogs that had been exposed only a few days. In stating that the serum should be administered within four days after infection to insure success, we wish to make it plain that we refer to the date of actual infection and not to the time of first exposure.

General Summary of Results.

In the experiments of 1905 and 1906, thirteen immune hogs (including hog 1401) were used for the production of serum, and all of these, with one exception (immune Q No. 1, 1905), after hyper-immunization have furnished serum that in doses of 15 cc. or more gave protection from a simultaneous injection of disease-producing blood. When smaller doses of serum were given, differences in the potency of the various sera could be observed. The doses of immune serum given with disease-producing blood varied from 2½ to 20 cc., and, as was to be expected, some of the hogs that received the smaller doses were not sufficiently protected. In summarizing the results of these experiments, therefore, the percentage of loss which resulted from vaccination is not to be regarded as representing what

would occur in the practical application of the method, for, as already stated, when a sufficient dose of serum is used no deaths are caused by the immunizing treatment. Even though, for the reasons just stated, the average results of our experiments are not to be considered as representing what should be obtained in practice, a summary of these results is not without interest as showing in a general way the behaviour of serum-treated hogs as compared with unprotected hogs when both are exposed to disease through injections of disease-producing blood.

In all, 168 hogs were given a simultaneous injection of serum and disease-producing blood, the dose of serum varying from 2½ cc. to 20 cc. Of these, thirty-five, or 21 per cent., showed visible symptoms of illness after injection, and fifteen, or approximately 9 per cent. of the total number, died. As a contrast to this we find that fifty-four hogs were injected with the same dose of the same disease-producing blood alone. Of these, fifty-four, or 100 per cent., became sick, and fifty, or 92·5 per cent., died of hog cholera. These figures we believe, show beyond doubt that by hyper-immunizing immunes in the manner described in this paper a highly potent serum may be secured. We are confident also, as a result of the experiments we have described, that had we used the larger doses of serum in all cases or else reduced the dose of disease-producing blood the percentage of deaths following vaccination would have been so small as to be without practical significance.

Transmission of Disease by Hogs Treated by Serum-simultaneous Method.

To test the possibility of disease being conveyed to normal hogs by hogs that had been vaccinated, fifty-eight shoats were placed in the pens with the vaccinated hogs. Of these pen checks none became sick unless some of the vaccinated hogs with which they associated became severely ill; indeed, in a number of instances the pen checks remained well, even though they associated with vaccinated hogs exhibiting undoubted symptoms of hog cholera. From this it appears that the immune serum not only possesses the power to protect hogs from a simultaneous injection of disease-producing blood, but that even in cases where too little serum is given it yet has a marked tendency to lessen the infectiousness of the disease. Of the fifty-eight pen checks exposed to vaccinated hogs, six contracted hog cholera and five died.

As a control experiment, nineteen shoats were placed in the pens with the hogs that were injected with disease-producing blood alone. Of these, all became sick, seventeen died, one was killed to secure blood for other experiments, and one recovered. In other words, of the pen checks exposed to hogs injected with disease-producing blood alone, 94 per cent. died, whereas only 8 per cent. of the checks exposed to vaccinated hogs succumbed.

Immunity in Hogs after Serum-simultaneous Vaccination.

In describing the individual experiments, attention has been called to the accidental exposure to hog cholera of those vaccinated hogs that were being reserved for a late exposure in order to test the duration of the immunity conferred by the serum-simultaneous and

the serum-alone methods. The pasture in which this accidental outbreak of disease occurred, contained a large number of hogs which had been treated at different times, and as a consequence this exposure took place only a few weeks after vaccination in the case of some of the hogs, while in the case of others the interval between vaccination and exposure was as great as three months. Aside from the hogs that were accidentally exposed in this way, a considerable number were placed in the exposure pen within three weeks after vaccination, the object being to compare the immunity at this time with that exhibited by others treated in the same way but exposed very much later. For the reasons given, this comparison could not be made in all cases, and all results of exposure to hog cholera are therefore considered together in this summary, it being understood that exposure took place from three weeks to three months after vaccination.

Of the hogs treated by the serum-simultaneous method, 136 were exposed to hog cholera, and four, or nearly 3 per cent., died as a result, while of sixty-eight unvaccinated hogs exposed under the same conditions, fifty-six, or approximately 82 per cent., died.

In regard to the four vaccinated hogs that are stated to have died from exposure after vaccination, it should be noted that there is room for considerable doubt as to the cause of death. In only one of these hogs (1780) were typical lesions of hog cholera found at autopsy; and as this hog remained unthrifty after vaccination, and as its mate (1781) treated in the same manner died from vaccination, it is not unlikely that the intestinal lesions found at the autopsy of hog 1780 resulted from vaccination and not from exposure. Neither of the other three hogs exhibited lesions of hog cholera at autopsy, and two of them (1552 and 1556) passed through exposure in the pasture and only succumbed when placed in the exposure pen. The conditions in this exposure pen were not conducive to thriftiness, for no attempt was made to disinfect or clean the pen, as this might have defeated its object, which was to furnish a certain and severe exposure to hog cholera. Before leaving this subject, we wish to state our conviction that, small as was the loss among vaccinated hogs exposed to hog cholera, this would have been even less had the exposure taken place under the conditions usually met with in practice.

Immunity in Hogs Treated with Serum Alone.

In all, fifty-eight hogs were treated with serum alone in the experiments of 1906. None of these showed any ill-effects from the treatment, and forty-nine were subsequently exposed to hog cholera. Of these, twenty-three, or 47 per cent., survived exposure, whereas of sixty-eight untreated hogs which served as controls only 18 per cent. survived. It is thus evident that the protection afforded by the hyper-immune serum when given alone, while it did not equal that afforded by the serum-simultaneous method, was nevertheless sufficient to protect nearly 50 per cent. of the treated animals against subsequent exposure.

As regards the duration of the protection afforded by the serum when given alone, we find that of forty-nine animals treated with serum alone, twenty-six were exposed within three weeks after receiving the serum, and twenty-three were exposed after one to three and a half months. Of the first lot, exposed within three weeks

nine, or 34·6 per cent., died as a result of the exposure, while of the twenty-three exposed after one to three and a half months, seventeen, or 73 per cent., succumbed. From these results it would seem that the protection afforded by the serum when administered alone is not as lasting as when administered in combination with diseased blood.

Curative Value of Hyper-immune Serum.

The exact method of carrying out the experiments has been described elsewhere. Twelve hogs that were certainly infected with hog cholera were treated with serum after the lapse of different lengths of time, and the results showed that doses of 15 or 20 cc. were sufficient to save the life of the treated hogs, provided the serum was given within four days after the date of infection. If given later than this, even much larger doses (35 to 50 cc.) were not sufficient to save the infected hogs from the severe exposure to which they were subjected.

Comparative Potency of Sera from Hogs Possessing Natural Immunity and from those Possessing Acquired Immunity.

Attention has already been directed to the difficulty experienced in deciding whether a particular animal should be classed as one possessing acquired immunity or natural immunity. In fact the whole question seems to be simply one of degree of resisting power on the part of the hog. In any outbreak of hog cholera it is probable that at least a few hogs will survive. Some of these may have been markedly sick and have recovered only after a long spell of the disease, while others may have been only slightly indisposed, and still others may not have exhibited visible symptoms of disease. It seems hardly correct to speak thereafter of one of these hogs as a natural immune, and to regard another as having acquired immunity through the attack of disease. We are rather inclined, in the light of our present knowledge of the disease, to regard all hogs as being naturally susceptible, but varying greatly in the degree of resisting power which they possess. If this assumption be correct, it would be expected that a protective serum might be obtained by the hyper-immunization of any immune hog, the differences in the serum from different hogs being simply in degree of potency, and depending probably upon the intensity of the reaction produced by the injection of diseased blood.

In actual practice we have been able to secure but one immune that had actually been sick of hog cholera that was vigorous and suitable for hyper-immunization. The serum from this immune (1392), as the records show, is not more potent than that obtained by similar methods of hyper-immunization from other hogs that had never shown visible symptoms of illness when exposed to hog cholera. In fact the sera from the different immunes, with the exception of hogs Q No. 2 and No. 1310, were quite uniform in potency. The lesser potency of the sera from the two hogs just mentioned cannot be explained upon the ground of natural immunity, but probably was caused by some individual peculiarity which we do not understand.

Before closing this discussion we wish to suggest to anyone who may have occasion to repeat these experiments that it is essential to make sure that the outbreak from which blood is secured for hyper-immuniza-

tion exhibits all of the characteristics of hog cholera,[1] and likewise that the blood used in conjunction with the serum for serum-simultaneous vaccination is taken from a hog suffering from undoubted hog cholera. In addition, more than one hog should be hyper-immunized in order that individual peculiarity on the part of one hog may not lead to erroneous conclusions. As the methods herein described involve the use of a disease-producing virus, we believe that only those trained in bacteriological methods should attempt to use them, and in all cases, before the serum is employed in a practical way, the amount required to give protection from a fatal dose of disease-producing blood should be determined experimentally.

Conclusions.

(1) When hogs immune from hog cholera are injected with suitable amounts of virulent blood taken from hogs sick of hog cholera, the blood serum of the immunes acquires the power to protect non-immune hogs from an otherwise fatal dose of disease-producing blood administered simultaneously with the serum.

(2) Immunes which have never exhibited symptoms of disease after exposure to hog cholera (natural immunity) may furnish equally as potent serum as those which have recovered from an attack of the disease (acquired immunity).

(3) Hyper-immunization may be accomplished equally as well by the administration of one large dose of disease-producing blood as by repeated injections of smaller doses.

(4) Hyper-immunization may be accomplished with blood from any virulent strain of hog cholera.

(5) Hyper-immunized hogs probably retain for several months the power to furnish a potent serum.

(6) Serum from properly hyper-immunized hogs in doses of 20 cc. should protect non-immunes weighing from 25 to 50 lb. from a fatal dose of disease-producing blood administered simultaneously.

(7) Immunity in hogs treated by the serum-simultaneous method lasts at least three and a half months, and probably longer.

(8) In serum-simultaneous vaccination it is not necessary to produce illness in the vaccinated hog, in order to secure an immunity lasting for at least three months.

(9) If a sufficient dose of serum is given, hogs are not injured by the serum-simultaneous vaccination.

(10) Hogs vaccinated by the serum-simultaneous method do not communicate disease to others unless they themselves become sick.

(11) Serum administered alone may not furnish complete protection for a longer period than three weeks.

(12) The serum probably can be used successfully as a curative agent if administered in the early stages of the disease.

[1] See Bulletin 72, Bureau of Animal Industry, p. 12.

ERADICATION OF TUBERCULOSIS.

BY BURTON ROGERS, D.V.M., KANSAS.

THE Iowa Experiment Station at Ames recently tested a herd of cattle for tuberculosis with tuberculin. Those reacting, and thus considered tuberculous, were placed in one lot, and those not reacting, and therefore considered as free from tuberculosis, were placed in another pen. Then twenty-six healthy pigs were put in each pen with the cattle. A few months later, when the hogs were mature, they were sent to market for slaughter, and carefully followed to the Government Inspector. Twenty-one of the hogs that had associated with the tuberculin reacting cattle were found to be tuberculous, while none of the others were diseased. Not only did the tuberculin but so did the hogs test the cattle.

While a Federal Veterinary Inspector, in 1904, the writer instituted an experiment in an Iowa packing house, and which has been continued since, namely, of tagging all the hogs bought direct from the farmers. Recently the State Veterinarian ordered the cattle to be tested on fifteen of the farms from which tuberculous hogs came, and in every instance tuberculin reacting tuberculous cattle were found. Again, the tuberculin and the tuberculous hogs paralleled in testing the cattle.

During the fiscal year 1907, the 5,000,000 farmers of this country marketed 31,815,900 hogs that were slaughtered and United States inspected: 430,177 of these were found to be tuberculous, 65,618 being badly enough diseased to be unfit for food.[1] Economy? Again, these 430,177 tuberculous hogs automatically tested dangerous tuberculous cattle, and other products on the farms from which they came. These products vitally concern the people of this nation. However, the test was not complete, for the reason that through the consecutive channels of trade, viz., from farmer to local hog-buyers, to stock trains and Union stockyards, to speculators and packers, their identity was lost by the time they reached the Inspector, and were found to be tuberculous.

We are short-sighted indeed if we do not realize that the simplification of this perplexing problem, in the West at least, is to require that all animals entering the channels of trade for a limited time, be tagged with tags that will remain until the animals have been inspected. These are the farms that need immediate attention; the vast majority of the others do not. It is the quickest way to bring many unsuspecting farmers face to face with the fact that they need to do something, For tuberculous cattle mean tuberculous calves, tuberculous hogs, tuberculous chickens, and last, but not least, tuberculous babies and tuberculous people. If it is a function of the State to protect purchasers from harmless deceptive manufactured substitutions and frauds that merely fail to give value receievd, it is primarily and manifestly more important to protect consumers from dangers that are hidden, yet menace life and health. One is a coated pill that contains a harmless nothing, the other an unrecognized and unrealized dangerous something. The Romans' first law was "Public Safety."

[1] In the British Isles any degree of tuberculosis of swine is regarded as sufficient to justify condemnation of the whole carcase owing to the great tendency to rapid generalization. In that case all the 430,177 would have been condemned.—ED., *V.J.*

Since the Government and the communities have allowed insufficiently informed and non-convinced men to build up a business upon an insecure foundation without protection or restraint, it has a co-operative duty for a limited length of time, rather than an immediate persecutive duty toward those unfortunate owners of tuberculous stock. The individual should not be wnolly burdened, but the community should partially co-operate by appropriate apportionments of taxes for public good. Because we do not at present know which are and which are not safe, necessitates considering all uncertified raw dairy produce as possibly dangerous. The State should eradicate the doubt. A campaign for the eradication of tuberculosis should be divided into a series of chronologically successive stages, each reasonably limited in time by law: (1) Education; (2) convincement; (3) co-operation; (4) prosecution (if need be). Under no circumstances should the order be reversed.

To-day, most tuberculous people are sufficiently informed and convinced in doing that which will prevent infecting their fellow-beings. Thanks to the human medical profession, the inter-human transmission of tuberculosis has almost ceased to be a problem in many progressive quarters. It was largely a matter of individual effort. And so to-day animal tuberculosis in its relation to man is the paramount problem; and, since the individual cannot protect himself, it is a need for Governmental effort.

SULPHUR AND LIME AS A DIP FOR SHEEP AND GOATS.

(1) Take 25 lb. of well-sifted sulphur and 18 lb. of new lime (unslaked preferable); add 3 or 4 gallons of water to the lime, and mix thoroughly with the sulphur into a paste.

(2) Throw the mixture into a pot containing 25 or 30 gallons of boiling water, and allow this to remain boiling for from thirty to forty minutes, until a dark purple scum rises to the surface.

(3) The water and sediment should then be taken from the pot and thrown into a tub (placed on the side of the dipping tank), with a bung-hole 4 in. from the bottom; when the sediment has well settled down the pure liquid may be run off into the tank, and the refuse thrown away.

(4) For every 25 lb. of sulphur and 18 lb. of lime, 100 gallons of clean water must be added, and it is desirable (though not altogether essential) that the temperature of the water in the tank be maintained at a lukewarm heat throughout the operation of dipping.

(5) Great care must be taken to prevent any sediment being thrown into the tank.

This dip is recommended not only on account of its economy and safety, but also for its curative as well as preventive properties.

Sulphur and Caustic Soda as a Dip for Sheep and Goats.

Take: 5 lb. caustic soda. 98·99 per cent.
20 lb. best flowers of sulphur.
100 gallons of water.

Take an ordinary tub or iron vessel. Mix the sulphur with sufficient water to form a thin cream. Then sprinkle the caustic soda slowly into the cream, stirring the mixture thoroughly until all the soda is in. In forty minutes the resulting fluid can be poured into the 100 gallons of water. The ingredients necessary to make a larger quantity than 100 gallons of dip should not be mixed in bulk. If, for instance, 1,000 gallons of dip are required, ten separate lots should be made as above. Mixing in bulk is liable to result in the materials becoming caked, and not properly dissolved. All lumps in the sulphur should be carefully broken up. The mixture should on no account be boiled. The caustic soda should be ground into fine powder, and used as quickly as possible.

DIRECTIONS FOR TREATMENT OF INFECTED KRAALS.

Experiments which have recently been made have shown that kraals in which infected sheep or goats have been kept can, when abandoned, retain the germs of infection for from six to twelve months, and possibly longer. It is therefore necessary when cleansing infected sheep to treat the kraals and sleeping places in, or on which, the stock have been kept.

The following directions are therefore given :—

(*a*) Stone kraals : All dung should be destroyed by fire or dug out and used for manure. If the latter process is adopted, grass, straw, or dry bushes should be spread over the floor and high up around the walls of the kraal, and burnt.

(*b*) Old sleeping places in the veld should be ploughed up or dug over, and burnt.

(*c*) Bush kraals or those made of sods or dung cakes should be burnt, or where this is impossible, the infected premises should be enclosed with a strong, well-constructed wire fence.

(*Agricultural Journal, Cape of Good Hope.*)

Clinical Articles.

UTERINE HERNIA IN A MARE.

BY W. WATERS, M.R.C.V.S., BLOFIELD, NORWICH.

SUBJECT : A chestnut cart mare, aged 8.

April 10, 1908.—I was called to the above mare because the owner said she was very stiff in her hind quarters. I found that the mare seemed very disinclined to move, her body was very pendulous (although she had another month to go in pregnancy), and she was rather constipated. Thinking that stiffness was probably due to constipation, I gave her a dose of linseed oil and turpentine, laxative diet, and warm water enemas.

April 11.—Mare seemed a trifle better, and not quite so stiff. There was, however, noticeable now, a slight increase in size of udder. As I was wanting to go out in another direction the following day, and mare seemed better, I arranged with owner not to call till the 13th, unless he sent for me.

April 13.—On entering the box I was simply astounded at the great change which had taken place since I saw the mare on the 11th. The swelling of the udder, which I had noticed casually on previous visit, was increased ten or twelve times in size; in fact, there was a large swelling about the size of a man's body, extending from usual seat of udder to near cariniform cartilage of sternum, which swelling was only about 1¼ ft. from ground. The udder with its mammæ were carried a long way forward so that each teat on its respective side seemed as big as, and in the position of, the sheath of a gelding; in fact, so striking was the similarity that any man standing, say 15 to 20 yards away, would have wagered anything he possessed that the animal before him was of the male sex.

Upon enquiring of the owner I found that he saw nothing alarming on the previous day except slight increase of swelling of udder, and that the condition of mare as above described had all taken place during the night. Of course there was not much doubt as to diagnosis, *i.e.*, that of hernia of uterus and its contents, but as I thought it a very peculiar case to treat, I called in a neighbouring practitioner, Mr. J. E. Porrett, of Lodden. We eventually decided that the only thing to do was to sling the mare, as the body was so pendulous now and back so swamped that she could scarcely stand. Great care, of course, was taken to prevent chafing, and mare was kept on laxative diet.

On April 18 I was sent for as the mare showed signs of foaling, which event took place about an hour and a half after my arrival. Foal lying in normal position and being born alive, but soon expired. I had to let mare out of slings to foal, and after getting up she seemed so much better that I decided to let her remain out.

The next few days she improved in strength marvellously, and at this present date, June 1, is turned off to grass. The hernia, of course, is not so large now, but there is considerable swelling still present, probably due to empty uterus, and some of bowels filling space previously occupied by foal. The mammæ are still very much enlarged, and in situation of gelding's sheath. On the whole, however, the mare is much better, and I hope to see her a useful working mare in the near future, although she seems bound to have this large hernia and swamped back for the rest of her days.

DEATH FROM HÆMORRHAGE FROM THE POSTERIOR VENA CAVA, DUE TO ULCERATION.

BY CAPTAIN H. GAMBLE, ARMY VETERINARY CORPS, CAHIR, IRELAND.

THE subject was a Field Artillery horse, aged 12. The horse went to exercise with the battery, and was led, walking and trotting for about an hour and a half. The horses returned from exercise at about 10.45 a.m., and were watered at 11 a.m.; while this horse was at the water-trough he showed symptoms of colic, and was given a pint of linseed oil and 1 oz. of turpentine, after an enema, and walked about, after which he evacuated quite normal fæces but became very much worse and sweated profusely, and was with great difficulty kept on his legs. Soon after 12 noon, 8 grains of morphia were administered hypo-

dermically, which, however had absolutely no effect, and this was followed by a hypodermic dose of physostigmine. The horse continued to sweat profusely and attempted to lie down, wearing a very dull, anxious expression, whilst the visible mucous membranes were becoming more and more anæmic, and he was rapidly becoming collapsed. A loose box was well littered down and the horse walked into it, whereupon he was seized with a violent rigor, staggered round the box, fell down, rolled over on his back with his legs beating against the wall, and died within two minutes, the visible mucous membranes by this time having become absolutely anæmic. Death occurred about 1.30 p.m., and the *post-mortem* examination an hour afterwards revealed the presence of a large blood clot lying along the whole floor of the abdomen, covering all the viscera (as the horse lay on his back), and when this clot and the intestines were removed, two bleeding points were observed in the thickened, inflamed tissue on the under surface of the vena cava, about 5 in. behind its entrance to the anterior fissure of the liver, and these points proved to be ulcers, opening into the vena cava, which was in a condition of intense phlebitis, to the extent of about 3 in., and the tunica intima, posterior to the phlebitis, was extremely thin, although otherwise apparently normal. Death was due to hæmorrhage from the vena cava, and the ulceration of this vessel must have been due to some foreign body having worked its way through the duodenum into the vena cava, although after careful search no foreign body could be found, and no lesion in the duodenum. All the other organs and tissues of the body were normal.

Although aged 12 this horse had only three entries it his veterinary history sheet, the last being in 1906 for lameness from a bruised sole. The animal had been very regularly driven in a trap by the officer commanding the battery, for about seven years, and was a very good trapper. The most curious features of the case appear to be that the horse showed absolutely no symptoms of any sort or kind until about two hours before death, although the process of ulceration must have been going on for some considerable time, and the intense abdominal pain which continued without intermission until his death.

A CASE OF PHYSOSTIGMINE POISONING.

BY EDWARD ELPHICK, M.R.C.V.S., D.V.H., NEWCASTLE-ON-TYNE.

THE subject, an aged carriage gelding, had no passage of fæces on May 3. On the 4th no passage, and exhibited colicky pains with strangury. I was called in on the 5th. The animal displayed all the symptoms of impaction of the colon.

Having, as a rule, only obtained moderate results from the administration of physostigmine, I gave linseed oil with medicaments, and ordered hot copious enemas to induce micturition, the patient still exhibiting strangury.

May 6.—The patient was in much the same condition, no fæces passed, and mucous membranes a trifle dirtier looking. At 10.30 a.m. I administered subcutaneously 1½ grains physostigmine sulphate. At 11 a.m. there were intestinal murmurs and passage of flatus, with

no increased uneasiness. Pulse fairly strong and slow, slight muscular twitchings at the shoulder and in the flank. Respirations slightly increased; temperature 102° F.

I saw my patient an hour and a half later. He was in a state of collapse. Respiration 60, and shallow, pulse hardly perceptible, pupils contracted, mucous membranes cyanotic, temperature subnormal, extremities clay cold, and the animal swaying behind. The bowels had been evacuated thrice during my absence, in no great quantity, however, and the bladder had been emptied. I was informed by the owner that the animal had not shown any signs of increased pain during my absence beyond a little extra, perhaps, whilst evacuating and straining.

Subsequent Treatment.—Gave stimulants, ordered hot blankets to the body, pulled the ears, hand-rubbed the legs, and bandaged them. Left medicine to be given later, and orders for the blankets to be changed every hour and continuous hand-rubbing of the extremities. Later, on referring to my "Toxicology," I find I should have given atropine. Saw patient at 6 p.m. Pulse improved, respirations 35, temperature 103° F., body warm generally, pupil normal, animal standing easy, and movements under control. Has made an uninterrupted recovery. Was sold last week for £20.

THREE CASES OF HEART DISEASE IN HORSES.

BY CAPTAIN W. E. SCHOFIELD, A.V.C., SALISBURY PLAIN.

CASE 1.—*History.*—This animal was first admitted to hospital suffering from intermittent fever; the temperature would rise as high as 104° F., and continue above normal for four or five days, during which time the appetite would be lost; it would then drop to normal, and remain so for the next three or four days, during which time the animal would eat heartily, and appear quite well. At the end of that time the temperature would suddenly rise again with symptoms repeated as before.

The heart was sounded, but no abnormality could be detected beyond a certain amount of weakness in the heart beats. This continued for about a month, when, the temperature having remained normal for ten days, the animal was discharged to duty, apparently recovered. Three days afterwards it appeared dull, and slightly off feed; temperature was normal, but pulse was weak and irregular. During the night following it suddenly dropped dead in its box without a struggle. It had done no work since its discharge from hospital beyond gentle exercise.

Post-mortem Appearances.—The heart was normal in size, but its muscular tissue was very pale in colour, soft and friable, the result apparently of fatty degeneration. There was an abnormal quantity of heart-fat, which had not set, but remained more or less gelatinous. On opening the heart, the mitral valve was at once observed to be diseased, its cusps being much thickened, and dark purple in colour, as also was a considerable portion of the lining membrane of the left ventricle, thus showing acute endocarditis. The tricuspid valve was

also similarly affected, but in a much less degree. The organs of the body appeared normal. Death was therefore due to valvular disease of the heart, with acute endocarditis, accompanied by fatty degeneration of the heart muscle.

Case 2.—*History.*—This animal was a wheeler in a gun-team, and had always appeared perfectly healthy. While at practice recently, after a steady trot of about 1½ miles with the gun, it suddenly dropped dead.

Post-mortem Appearances.—All the internal organs appeared normal, with the exception of the heart. This organ was larger than normal, but its muscular tissue was firm, and of a good colour. On opening, both the mitral and tricuspid valves were found to be affected with verrucose endocarditis, apparently of some standing, the cusps of each valve being much thickened and covered with small warty growths. There was no appearance of acute endocarditis. The stomach was very full of food materials.

Case 3.—*History.*—This animal was a private one, hired for the training season; it was a big, heavy cart-horse, and was one of a team of eight horses used in the drawing of a heavy gun. It had done its work for a fortnight quite well, when, one morning, after assisting to take the gun out about 2 miles, it suddenly dropped dead.

Post-mortem Appearances.—The heart appeared normal in size and appearance externally, but on opening it the mitral valve was found to be extensively affected with verrucose endocarditis, the cusps being enormously thickened and covered with warty growths. The tricuspid valve, on the other hand, was quite normal.

REMARKABLE ACCIDENT TO A MARE.

BY G. MAYNALL, M.R.C.V.S., NORWICH.

The enclosed photograph is of a mare's head, showing an extensive wound on the side and under surface of the jaw caused by the animal putting her head over stakes with rough tops in a loose box and suddenly jerking back and catching the loose skin under the throat on one of the stakes, which tore it back from the angle of the jaw to near the chin. When brought in there was little chance of saving much skin or securing primary adhesion. Nevertheless, with a view to trying to save some of the pendent cuticle, the skin and exposed surface were cleansed antiseptically, and iodoform tape sutures put in along the edges of the jaws and up the side of the cheek. The hanging piece of skin measured about 1 ft. by 9 in. The sutures and edges of the wound were powdered with boracic acid and iodoform, a dose of physic given to the mare, and cotton wool and a many-tailed bandage put over the injury.

Next day the wound was dressed and syringed, and the following day, not much adhesion except at the inferior edge of the wound having taken place, about 10 in. of skin were cut off, and only two or three sutures left in. The raw surface was then dressed with zinc chloride solution and powdered with boracic acid and iodoform.

A piece of lint was put over the wound and secured in position by a bandage. The dressing was renewed daily for three weeks, and at the end of that time bandaging was dispensed with, and the wound left uncovered, and dressed with tannoform and boracic acid.

The mare was discharged on May 31 with a bare, dry patch about 6 in. by 5 in. on the under surface and side of the jaw. The time occupied in the healing process was forty-six days.

The case seems worth recording on account of the nature and cause of the accident.

PROTRUSION OF THE SMALL INTESTINE THROUGH THE ABDOMINAL WALL.—RECOVERY.

BY CAPTAIN GRIFFITH, A.V.C., COLCHESTER.

THE following case is interesting on account of its rarity. A troop mare, aged 5, belonging to the 8th Hussars, received a wound in the abdominal wall about 2 in. external to the right teat. This was caused by the animal coming in contact with a stake whilst taking a jump. Half an hour after the accident the animal was brought into the sick lines with a saddle blanket round its belly, in order to prevent the bowels from coming down. The blanket was removed, but as a mass of intestines and mesentery came into view, it was immediately put back into position.

It was difficult to say what length of bowel was visible, but 8 ft. is quite a safe estimate. The case appeared an urgent one, so the animal

was chloroformed standing, and put down by the aid of ropes on one fore and one hind leg, the head being depressed as the ropes were pulled. When completely under the anæsthetic, the blanket was removed and the intestines allowed to rest in a large, clean enamel dish held close to the abdomen. The bowels and wound were now carefully treated with a warm solution of lysol. Congestion of the exposed viscera was very marked—almost black in places. These were kneaded, after the hands had been rendered as antiseptic as possible. Attention was next directed to the wound, the skin wound was about 5 in. long, and the deeper muscular one a little shorter. The intestines were wrapped in a large piece of lint previously soaked in a solution of 1 in 700 perchloride of mercury, and held whilst the animal was placed on its back; they were now returned by placing the left hand flat over the wound, with first and second finger widely separated, to admit of gently pushing in a small piece of bowel with the right hand. The fingers were then closed. This process was repeated until all the bowel was returned.

To return bowel tissue through a tight wound into an already full abdomen requires a great deal of care and patience—more so, indeed than is generally supposed. Antiseptic irrigation was carried out over the wound during these manipulations.

Four interrupted silk sutures were inserted in the muscles and five in the skin wound, together with a plug of antiseptic gauze. The animal having recovered from the chloroform got up easily and safely.

Course and after Treatment.—The wound was treated antiseptically with a solution of perchloride of mercury 1 in 700. On the fourth day the temperature rose to 102·7° F., and then gradually fell. On the eleventh day colicky pains were shown, and the following draught was given early:—

℞ Tinct. asafoet.
Tinct. digit.
Tinct. zingib. ... ... āā 1 oz.
Tinct. cardamom.
Aquæ ... ... āā 2 oz.
M. ft. haust.

In the afternoon a ball as follows was administered:—

℞ Pulv. nuc. vom. ... ... 2½ drachms.
Pulv. opii. ... ... 1 drachm.
Ext. hyoscyam. ... ... 2 drachms.
Mass. commun. ... ... q.s.
M. ft. bol.

In the evening the temperature was 99° F. On the twelfth day the animal was much better, but on the next day the temperature rose to 103·2° F., and the following drink was given, as there was again pain:—

℞ Chloral. hydrat.
Pot. brom. ... ... āā ½ oz.
Tinct. asafoet. ... ... 1 oz.
Ol. lini. ... ... ½ pint.
M. ft. haust.

Enemata were also given, and as pain was evident in the evening, the above draught was repeated. On the fifteenth day the animal was brighter, and the following ball was given in the evening:—

℞ Ext. hyoscyam. ... ... 2½ drachms.
Pulv. nuc. vom. ... ... 2 drachms.
Mass. commun. ... ... q.s.
M. ft. bol:

Progress for two to three days was good, but on the nineteenth day colicky pains were again shown, and the animal remained recumbent, looking round at its side. In the evening the following ball was given :—

℞ Pulv. opii. ... . 1 drachm.
Ext. hyoscyam. ... ... 2 drachms.
Pulv. zingib. ... ... 1 drachm.
Mass. commun. ... ... q.s.
M. ft. bol.

The next day the animal seemed well until the evening, when it refused food and was again in pain, and the following ball was given :—

℞ Hydrarg. subchlor. ... ... 1 drachm.
Pulv. opii.
Ext. hyoscyam. ... ... āā 1½ drachm.
Mass. commun. ... ... q.s.
M. ft. bol.

Slight pain was shown on the next day, and also on the twenty-fifth, thirtieth, forty-first, forty-second, and forty-seventh days, but gradually became slighter. After a period of convalescence, the animal was discharged to duty after seventy-four days. All this time the wound had been doing well. Pain was shown occasionally, but about six weeks after its discharge from hospital the animal was again brought into the sick lines, showing greater pain than at any previous time. On examining the wound a slight discharge was seen, so the animal was cast and chloroformed, and a mass of pus about the size of a marble was found and removed. The nucleus of this appeared to be one of the deep silk sutures. The deeper parts of the wound appeared to be healthy. Silk sutures were again inserted in the external wound, which did well under antiseptic applications. Pain lasted on and off for twelve days.

The diet given during the first fortnight consisted of sloppy food and chaff, later on scalded oats were added to this, with boiled linseed once every alternate day. A few carrots were occasionally given.

Remarks.—The frequent attacks of pain in this case are interesting, as the mare was not previously subject to colic. Sometimes she would remain stretched out for hours. At others she was found on her back, and massage over the region of the wound seemed to give her ease. It is difficult to surmise what is the cause of this pain. One would feel inclined to suspect an abscess or adhesions. The inclusion of the bowel or mesentery in the sutures I am positive did not happen. The mare has been under treatment for abdominal pain again quite recently.

Abstracts and Reports.

INVESTIGATIONS OF ANIMAL DISEASES.[1]

BY DR. JOHN R. MOHLER.

Swamp Fever in Horses.

A DISEASE known as swamp fever, which prevailed among the horses of the Red River Valley, in Minnesota, was investigated in co-operation with the Minnesota Experiment Station, and already definite results have been obtained which not only throw new light upon the infection, but are highly encouraging with reference to the possibility of obtaining a satisfactory treatment for the disease. Confining conclusions strictly to the observations drawn from these experiments, the following summary is presented;—

(1) Swamp fever is caused by a micro-organism, and not by chemical poisons or poisonous plants.

(2) It is transmissible among horses and mules by inoculation.

(3) The virus is present in the blood. It has been demonstrated by inoculation tests to be present in the blood as much as nineteen days before death and twenty-four hours after death.

(4) The disease has been transmitted to a horse by subcutaneous inoculation of 5 cc. of blood.

(5) The incubation period is approximately from ten to thirty days, at the end of which time the first symptom a rise in temperature, appears. The disease when uncomplicated follows a chronic course, terminating in death.

(6) The disease is characterized by fevers recurring at irregular intervals, and by progressive anæmia, emaciation, and weakness. The pulse in the later stages is accelerated, though weak, stringy, and sometimes intermittent. The appetite is tremendous, and remains so even after the animal has become very weak. There is a marked wasting of the flanks and hind quarters, causing in the later stages of the disease a dragging and staggering gait of the hind legs.

(7) The most constant and characteristic lesions are found in the circulatory system, mainly in the heart.

Among the important problems which it is hoped that future experiments will solve are the following:—

(*a*) The nature of the virus and its isolation.

(*b*) Its distribution in the body, and also whether it is contained in the excreta.

(*c*) Whether the disease can be transmitted by the alimentary tract —that is, by feeding.

(*d*) The natural mode of transmission and infection.

(*e*) The susceptibility of other animals than horses and mules.

(*f*) Methods of prevention and cure.

Surra.

An importation of fifty-one carefully selected cattle from India (*Bos indicus*) during the summer season of 1906 brought to the New

[1] Abstract from the Report of the Bureau of Animal Industry for 1907, by A. D. Melvin, Chief of the Bureau.

York port a number of animals that were found by blood examination to be harbouring the animal parasite *Trypanosoma evansi*, the specific cause of surra. As serious losses had been experienced in the Philippines and in countries of the East through the infection of both horses and cattle with surra, it was at once determined to use every precaution in safeguarding the cattle and horses of this country from its fatal attacks. Each of the Indian cattle that developed the disease was promptly slaughtered and burned, and the healthy portion of the herd was kept carefully isolated in individual screened stalls of a fly-proof stable until repeated blood examinations had shown that they were free from trypanosomes, and until killing frosts in the late fall had removed all danger of the transportation of virulent blood from animal to animal by means of blood-sucking flies.

From this importation of surra much has been learned of the character of the disease, and of the remarkable periodical development of the living parasites within the blood of the affected animal. Virulent blood drawn from an affected animal and injected into a test rabbit will cause a sharp elevation of temperature after a period usually varying from five to eight days, but occasionally this period extends to ten or eleven days. At the time of the acme of the fever attack, if an examination is made of the blood of the inoculated animal numerous wriggling and squirming organisms will be seen moving about rapidly among the blood corpuscles, and manifesting their presence by an active disturbance of all corpuscles with which they come in contact. If the blood is examined daily, these moving hæmatozoa may be found present for two, three, or four days, when they suddenly disappear, while the temperature returns to normal. Now follows a latent or quiescent period, lasting for five or six days, during which the temperature of the animal remains at or near the normal point, and the animal eats as usual, only showing the effects of the parasitic invasion by a staring coat and by a slight loss of flesh and energy. At the end of the latent period the same course is repeated, and again an elevation of temperature and a return of the parasites occur, only to disappear more or less suddenly at the termination of the attack. These recurring periods of disease gradually undermine the strength and vitality of the animal until it succumbs.

Post-mortem examination of such an animal shows, first, general emaciation, and also that the hair has fallen from around the eyes, mouth, and nose, leaving bare, denuded patches. The external genitals are swollen and œdematous and more or less bare of hair. On opening the carcase it will be seen that the skin is firmly adherent to the tissues underneath, that considerable clear fluid has entered the peritoneal cavity, that the abdominal viscera have formed numerous fibrous attachments to the peritoneal walls, and that similar little fibres unite the various visceral organs into a more or less compact mass. The spleen will be found greatly enlarged, even to six or eight times its normal size. The liver and all the thoracic organs will usually be found unchanged. Variously scattered over the surfaces of the abdominal walls, both internal and external, may be found small collections of the *débris* of degenerated red blood corpuscles, and the outer surfaces of the digestive organs within the peritoneal cavity may exhibit scattered remains of similar hæmorrhages.

The disease produces very similar conditions in horses following

natural infection, and may be readily transmitted to ruminants and canines by means of infectious blood. Healthy rabbits were, for experimental purposes, placed in cages with rabbits that had been infected through injections of virulent blood, but no infection followed, even though they remained in this close contact for thirty days, eating and drinking from the vessels used by the diseased animals.

It will at once be evident that the spread of such a disease as this over the country would quickly lead to great destruction of live-stock and to great financial loss. To prevent these losses the best efforts of this Bureau have been exerted, and the disease has been rigidly controlled.

Tuberculosis.

The investigations relative to the immunization of cattle against tuberculosis have been continued throughout the year in conjunction with the Bureau Experiment Station, and the scope of the work has been extended by the application by the immunizing inoculations to an added number of cattle and also to a number of hogs. Some of this work has been done in conjunction with the Georgia Experiment Station, which, in addition to furnishing a number of cattle from the station herd for test inoculations, obtained permission from stock owners in the vicinity to have the experiment extended to some of their young cattle. This work, as formerly, consists in applying the immunizing test in a variety of ways, that the comparative efficiency of the various methods may be determined.

A number of cattle that have reacted to the tuberculin test, thus proving that they are diseased with tuberculosis, have been purchased, and are being treated by various methods with living and sterilized cultures of bacilli, for the purpose of perfecting, if possible, some method of treatment which will serve to check the advance of the disease, or possibly overcome it completely.

The examination of sediment taken from the cream separators of public creameries for the detection of tubercle bacilli has been continued, and the presence of these micro-organisms has been demonstrated in about 25 per cent, of the samples. This continues to brand the public creamery as an important source of tubercular infection for the hogs and calves that are fed upon the separated milk that is returned to the farm from the creamery, and shows the absolute necessity of having State laws compelling creamery companies to sterilize all milk and other products before returning them to the farmer for use as food for live stock.

The tubercular infection of hogs has been deemed a matter of sufficient importance to warrant a continuance of investigations into the most common means of contracting the disease by these animals. The danger offered to swine by being allowed to run over and feed upon the droppings of tuberculous cattle has been thoroughly tested, also the danger which threatens healthy swine from being brought into contact with fæces from tuberculous hogs. The probability of infection being carried from tuberculous brood sows to their litters has been studied, as well as the danger arising from the general herding together of healthy and tuberculous animals.

Owing to the increasing use of tankage from the packing houses as feed for hogs, and owing also to the fact that this substance has been

prominently accused of being an important agent in the spread of tuberculosis among these animals, investigations have been carried on with this material with a view to ascertaining the justice of its condemnation as swine feed. The work thus far done fails to show that tankage can be held responsible for originating or spreading tuberculosis among hogs.

The length of time that tubercle bacilli will continue to live and retain their virulence while in butter under usual market conditions is also being made a subject of investigation in co-operation with the Dairy Division. In these investigations butter has been made from milk that has been infected through the addition of bovine tubercle bacilli to the milk just previous to its passage through the cream separator, and another lot has been made from milk obtained from a cow with a tuberculous udder from which tubercle bacilli were being daily excreted in great numbers. These samples of butter have been prepared in both salted and unsalted conditions, and have been tested upon guinea-pigs by feeding and by inoculation tests immediately after its preparation, again after keeping in cold storage for a period of ten days, and again thirty days afterwards; and it is intended to repeat the tests after three and six months retention of the butter in a cold storage plant. The ability of these various samples to cause tuberculosis to develop in the guinea-pigs upon which they are tested will serve to demonstrate the length of life which may be expected of tubercle bacilli in both salted and unsalted butter when stored under ordinary market conditions for different periods of time.

In the year 1902 thoroughgoing and extensive experiments were begun for the purpose of studying the comparative characters of human, bovine, and avian tubercle bacilli. These investigations have been continued without cessation until the present time, and have led to the production of Bulletin No. 96 of this Bureau, which contains the results of this long series of experiments.

Another line of investigation inaugurated at the same time has been carefully brought to a satisfactory close. This was a study of transformability of tubercle bacilli from one type to another when subjected to unusual conditions of growth, both within animal hosts and upon artificial culture media. The results of these investigations are now in press in the form of an article in the Twenty-third Annual Report of the Bureau of Animal Industry.

Tuberculin Testing of Cattle.

During the past year there has been considerable agitation in the District of Columbia with reference to the improvement of its milk supply. In response to the public feeling which was thus aroused, the Commissioners of the District appointed a committee or conference composed of scientists, physicians, veterinarians, milk producers and dealers, attorneys, and business men to consider methods for obtaining pure and wholesome milk, and to advise as to proper legislation to that effect.

An effort is being made by a number of dairymen to produce milk under strict sanitary conditions, from cows which are not only apparently healthy but have been proven free from tuberculosis by the application of the tuberculin test. In order to assist in this work the

Secretary of Agriculture, about April 1, directed this Bureau to apply the tuberculin test to the herds of all dairymen who might request such action; consequently the report of this work embraces only the last three months of the fiscal year.

To derive the greatest benefit and permanency from the work, a form of agreement was prepared which must be signed by each dairyman before his application for the test is granted. This agreement provides that all animals which react to the tuberculin test, and in addition exhibit clinical symptoms of tuberculosis, shall be slaughtered and their carcases disposed of according to the meat inspection regulations of the Bureau of Animal Industry, thus placing the disposal of tuberculous carcases upon a rational and economic basis. Further, all animals which react to the tuberculin test and exhibit no other evidence of tuberculosis may be slaughtered and the carcases passed for food or condemned, under the conditions named in the first instance, or they must be completely segregated from the healthy portion of the herd and maintained in that condition after the system of Bang. If such animals are producing milk it is not permissible to use it for any purpose whatsoever without having previously sterilized it. The offspring from these reacting segregated animals must be removed from the parents immediately after birth and fed upon the milk of healthy cows or the sterilized milk of their own parents. These conditions tend to lessen the financial loss to the breeder by enabling him to perpetuate a valuable strain of cattle which he has been creating, and thereby gradually to build up a new herd which will be entirely free from tuberculosis.

In addition to these measures, the agreement provides for the thorough disinfection of contaminated premises and the compliance with all reasonable sanitary measures recommended by the Bureau of Animal Industry or the Health Department of the District of Columbia.

A system of tagging the ears of all cattle tested is in use. Two varieties of tags are used, stamped in serial numbers, one variety to be attached to the right ears of passed animals and the other to the left ears of the reacting animals. The work is being carried out in the District of Columbia, Maryland, and Virginia. Already the Pathological Division has tested 28 herds, representing 526 cattle, of which 99 head, or 18·82 per cent., proved to be tuberculous. In addition to this there are records of 9 herds tested by District of Columbia veterinarians, which include 132 cattle, of which 19 head, or 14·39 per cent. proved to be tuberculous. Taking the totals of the amount of testing performed, it appears that in 37 herds, embracing 658 cattle, 118 animals, or 17·93 per cent., proved to be tuberculous. This percentage illustrates the great necessity of the work which is being performed.

The results, which are already evident, are highly encouraging, as each herd tested acts as a nucleus for the development of an educational centre which is of great value to the farmer and dairyman in creating an attitude favourable to the production of milk free from the contamination of disease germs.

It is also worthy of note that the herds belonging to all of the public institutions in the District of Columbia are tuberculin tested and are now free from tuberculosis.

Rabies.

The Pathological Division has continued to examine all cases of suspected rabies where laboratory assistance was desired. The presence of the so-called Negri bodies in the hippocampus major is at present considered to be the most valuable method of diagnosis. In all cases where they are found and the changes in the plexiform ganglia are also present, a diagnosis of rabies is at once reported and rabbit inoculations are not made.

Forty-seven suspected cases were received during the year, of which twenty-seven (all dogs except two—a sheep and a cat) were found to have been affected with the disease. Twelve of the positive cases were from the District of Columbia, six from Virginia, five from Maryland, and one each from Maine, Wisconsin, North Carolina, and South Carolina. In two of the cases we were unable to give a diagnosis by either of the rapid methods of examination. One was chloroformed early in the disease, which is sufficient to account for the negative microscopic findings. The other died naturally, and is an example of those rare cases where rabbit inoculations are necessary to establish a diagnosis even when the disease has run its course.

Necrotic Dermatitis in Sheep.

During the past winter this disease broke out in a number of bands of sheep in Montana and rapidly spread, affecting a great many animals. It was confined principally to the face and head, and occasionally to the feet. The lesions consisted of patches varying in size from $\frac{1}{4}$ to $\frac{3}{4}$ in. in diameter, devoid of wool, and covered with thick, dry, brown crusts which, when forcibly removed, exposed a granulating base covered with pus. Three live animals affected with the disease were forwarded to the laboratory, from which cases the *Bacillus necrophorus* was isolated.

In March a similar outbreak occurred in a flock of about 150 sheep and lambs at The Plains, Va., which was investigated by the Bureau. The adult animals were affected before they commenced to lamb, and the udders showed lesions of the disease. As the lambs were born they rapidly became infected, the lesions appearing about the head and on the legs as irregular granulations, which projected above the surface and in some cases were pedunculated. There were no lesions in the mouth. Cultures made from these cases also developed *B. necrophorus*.

The disease runs a mild course in the majority of cases, and even in the severest forms it rarely causes death. Treatment with antiseptic washes and ointments usually effects a speedy cure.

Urticaria in Hogs.

Affections of the skin in hogs are very common, and as some of the skin lesions are frequently associated with infectious diseases a thorough knowledge of the various cutaneous affections is of great importance from the standpoint of a differential diagnosis. A very frequent affection of the skin in hogs is urticaria (diamond skin disease, rash, &c.), and as the lesions closely resemble those of swine erysipelas of foreign countries, this condition of the skin was carefully studied as to its etiology and pathology. It was found that urticaria in hogs is merely

a localized affection of the skin in which a bacterial invasion plays no part. The cutaneous symptoms may result from various causes; thermic influences on the skin, irritants, certain drugs, and gastro-intestinal disorders may produce the characteristic rash of urticaria. In most of the cases in hogs it is brought on by a gastro-intestinal catarrh with the subsequent action of the absorbed fermenting toxins upon the walls of the blood-vessels. The condition may be classified as a mild inflammatory exudative process in which the pathogenesis is identical with that of any other inflammation. It is produced by a direct influence of the cause on the wall of the vessel, and not through the influence of the central nervous system, as has been formerly supposed. An article on this subject is now being prepared for publication.

LAMZIEKTE.[1]

BY J. SPREULL, M.R.C.V.S., KOOPMANSFONTEIN.

THE investigation work of Mr. Thos. Bowhill, F.R.C.V.S., late of Grahamstown, in connection with what is known as coast lamziekte, or, as he termed it, "pasteurellosis," has recently been largely confirmed by Mr. Wm. Robertson, M.R.C.V.S., his successor at the Veterinary Laboratory, Grahamstown. In the following remarks I wish to set forth the results of my recent work at Koopmansfontein, which so largely confirm the work of these investigators, and, in addition, to place on record descriptions of the disease as it is met with in this area in cattle and goats. The variations of type in the symptoms during life, and lesions at the necropsy appear to me to be sufficient excuse for this my contribution to the literature on the subject, and I trust that it will be useful, if only for comparison with the disease as seen on the coast.

In my annual report for 1906, I tried as fully as I could then to describe how my change of headquarters from Somerset East to Grahamstown had brought me into contact with a new disease, which up to then I had barely seen. Referring to it I wrote, "It is this disease which, in its apparently hydra-headed forms, led Dr. Edington to his correlation of diseases theory and the erroneous conclusion that horse-sickness, blood-lung, veld-sickness and gall-sickness (by which he generally meant lamziekte) and heartwater were one and the same disease. Until my arrival in Grahamstown I had had almost no experience of this disease (pasteurellosis), and I was for a time unsuspicious of it until at the almost inevitable *post mortem* I found the same type of lesions and the same infection running through cases which I had supposed to be widely different in their causation and pathology." My transfer to Koopmansfontein seems only to have brought me face to face again with the same malady, but in slightly altered phases. It has, moreover, given me opportunities of investigating such cases bacteriologically and by means of experimental inoculation, and so extended my acquaintance with this type of disease

[1] Reprinted from the *Agricultural Journal of the Cape of Good Hope.*

as to confirm me still further in the views then expressed. Let us first consider.

LAMZIEKTE AS AFFECTING BOVINES—NOMENCLATURE.

The farmers have given to this disease the name "lamziekte," which is descriptive enough as far as the paralytic form is concerned. The name is sanctioned in the Cape Colony by long usage, for in some parts the disease has been known for about forty years, and I employ it here because no other would appeal so well to our farming community. It does not, however, aptly fit the throat form nor even the very acute lung and bowel forms in which paralysis only appears when the animal is *in extremis*. According to its type it is frequently called also blood-lung, imapunga, veld-sickness, gall-sickness, and also heartwater (the latter quite wrongly). Very frequently, also, acute cases are mistaken for some severe form of vegetable poisoning.

Lamziekte must not be confounded with stijfziekte or stiff-sickness, a disease affecting the bones and joints, chiefly of the fore legs, and causing bony enlargements around the fetlocks and coronets, and deformity of the hoofs. I am aware that cases of chronic lamziekte in this area are often called stiff-sickness from the peculiarity of the animal's gait, but I prefer to reserve this term for the bone disease proper, and to distinguish true lamziekte, which is not a bone disease, by the fact that in it no bony enlargements ever take place. During my stay at Koopmansfontein no case of stiff-sickness has come under my notice. I am also informed that cases of stiff-sickness do not develop into lamziekte nor *vice versâ*, whilst it is a common thing for chronic cases of lamziekte to recover more or less completely and die later from the acute form.

Distribution.—Lamziekte in one or other of its forms enjoys a very wide distribution in this colony. It is certain that not all of the diseases called lamziekte are really due to this infection, but on the other hand some others masquerading under different names will be found to be identical as regards their causal organism; for instance, to my certain knowledge acute cases, both in cattle and goats, are frequently called gall-sickness. It is the difficulty of its recognition with any certainty which has made it nearly impossible for anyone to get at its areas of distribution. To do so I have laid my colleagues under contribution with only moderate success. It is commonest and most severe in the coastal districts of the Eastern Province, but is probably to be met with within restricted areas in nearly every district from Cape Town to East London. Generally, it is confined to sour veld areas, but lately it has also invaded Karoo veld in the Cradock district. It is also present in some parts of the adjoining districts of Somerset East and Bedford. In Alexandria, Albany, Bathurst, Peddie and Victoria East, it is well known and dreaded accordingly. Mr. Freer has seen it on the sour veld of Uitenhage and Humansdorp district; Mr. Dixon in the districts adjoining East London; Mr. Hutchence has met with it in "three areas on the high sour veld on the upper slopes of the Drakensberg (Griqualand East) facing south-west," but his description and the lack of mortality in his outbreaks makes its identity uncertain, though his cases do bear some resemblance to paralytic lamziekte. It is well known over nearly the whole of Griqualand West and many parts of Bechuanaland as far north as the Lange-

berg and along the south bank of the Orange River as far west as Upington.

I think that it is certainly to be met with in the Orange River Colony districts adjoining Kimberley, and likewise in the Western Transvaal. It is not known in Rhodesia, but possibly it exists in Natal, where the so-called "gall-sickness" is very prevalent.

The Cause.—Since acquiring sufficient knowledge of the disease to enable me to search for it aright, I have been able to recover, with unvarying success, the same organism from all cases of lamziekte here, and have cultivated it on artificial media in the incubator and found it virulent on inoculation into healthy animals. This organism conforms in all respects, except in its active motility, with Lignières' description of the pasteurella, that is to say it is a cocco-bacillus appearing under the microscope in the form of a tiny bipolar, stained at each end and clear in the centre, polymorphic, sporeless, and preferably aerobic; it does not stain by Gram's method, grows well on gelatine, agar, agar and beef broths, it forms on naturally acid potato a growth which is invisible to the naked eye; it does not liquefy gelatine nor coagulate milk, and during its growth forms neither acid nor indol, its cultures have a characteristically sour and very disagreeable smell. It is generally associated with other organisms, such as *Bacillus coli* and staphylococci, and much labour is often entailed in the endeavour to isolate it in a state of purity; when successful, my culture conformed to the above description in all cases.

Although there no longer seems to be good reason for doubting the specific nature of this disease, there are certain exciting causes which seem to play an important *rôle* in its production. The disease is met with sporadically all the year round, but its season of greatest prevalence is from September to the end of January, depending in this area very much upon the amount of the rainfall. Lamziekte is always prevalent in the hottest weather when the rainfall is desultory and insufficient, and cases keep coming on until good rains fall and put the veld in good condition. This year, the rains having almost entirely failed, has brought on a crop of cases in February, while last year the good rains in January almost made the disease to cease. All are agreed that lamziekte is most prevalent when the grass shoots up and again withers away under the weather conditions above indicated. Inmuch the same way burnt veld is believed to be very dangerous as a producer of lamziekte, and probably this is because the young grass, shooting up without the protection of last year's old tussocks and bush, is more prone to wilting than where the veld is not burned; evaporation from the surface of the soil itself must be greater under such conditions.

Many incline to blame the water supply, and it is said that cattle which drink at a large river will seldom or never contract the disease. This appears to me easy of explanation when we turn to the germ as the actual and only cause necessary for its production. A large river, even if polluted in its bed during the dry season, would, by dilution, when in a flood, wash itself clean, and so prove innocuous to cattle drinking its waters, whereas a very small one would be more dangerous, whilst the water of dams and boreholes, unless protected from all sources of contamination by animal excreta, would tend to become more and more a centre of infection. In my opinion this is actually what occurs, for a farm once infected seems always to remain so.

There is danger also, I consider, in allowing cattle to drink at pans upon an infected farm. Mr. Robertson's recent investigations have shown that the infective germ of lamziekte flourishes in the water of dams upon infected farms along the coast, and we have been able to confirm his results in this area.

The disease seems to be neither contagious nor infectious in the ordinary sense, the virus doubtless escapes from the economy of the sick animal in its fæces and other discharges, and remains in the soil or water just as in anthrax or blackquarters.

On all farms upon which this infection exists, the cattle and small stock evince a craving for bones. On the other hand, on farms free from lamziekte this peculiarity is not manifest to anything like the same degree. Every cattle owner knows how the favourite cow will run away with one's washing, but this is a playful pastime compared to the zeal with which cattle on infected farms furbish in the ash heaps and roam around the farm house or native huts in search of bones, &c. This craving almost amounts to disease; it has been noticed in other parts of the world (Argentine Republic) where forms of this malady prevail and may with some truth be reckoned as the first symptom, or, at any rate, as a sign that something is wrong in the animal's economy. Where a liberal lick of bonemeal is supplied, it will be readily seen after a time how this craving ceases, but under the worst weather conditions (or shall I say period of greatest infection?) it reappears in some cases even in cattle dosed by the mouth as frequently as are our cattle at Koopmansfontein. Nor is it bones alone which are picked up and chewed, stones and preserved meat or milk tins serve almost as well, but as they do not break into pieces, they are generally dropped after being subjected to vigorous chewing for as much as half an hour on end. Cattle will also at times pick up and swallow loose manure from the surface of the kraal.

I shall now pass on to describe the three commonest forms in which this disease has been recognized in this Colony, dwelling more particularly, however, upon the paralytic variety, which is the one most prevalent in this area.

Œdematous or Throat Form.

This form is met with in some of our coastal districts. I have no yet met with it in Griqualand West, and it must be rare, for in response to numerous enquiries I have only been informed of two such outbreaks. In February, 1906, I saw this form of the disease in a cow on a farm in the Peddie district. The outbreak was at first thought to be anthrax, but microscopic examination and the *post-mortem* lesions quite negatived this. Five cattle had died before my arrival. The sick cow which I examined had extreme difficulty in breathing owing to an œdematous swelling of the throat and head; her tongue also was swollen and lolled from the mouth, which was full of frothy saliva, froth also escaping from the nostrils; there was also fever, rapid wasting, and diarrhœa. Out of the five which died two had no external swellings, and were probably thoracic in type; but the other three showed symptoms identical with this cow. Cattle of all ages were affected except small calves, and four sick animals recovered. Deaths took place in from one to three days, but cases which recovered were sick for five days or more. Mr. Bowhill saw this form also in

this country, and recognized it as a form of pasteurellosis, whilst Mr. Dixon also says he has seen it in his area.

The Thoracic Form.

I have had two cases of this form at Koopmansfontein, and held a *post-mortem* examination upon another at Blikfontein, these more nearly coinciding with the type of case which I have seen in the Eastern coastal districts. In this form the *post-mortem* lesions do not differ greatly from those seen in the paralytic types, except in so far as the lungs are concerned. These are acutely congested, with early red hepatization in their dependent areas; more or less interlobular œdema, often with infarcts and ecchymoses under the pleura, the lesions being more congestive or hæmorrhagic in the peracute cases and more inflammatory in those in which death is a little longer delayed. They resemble acute pleuro-pneumonia contagiosa, but the changes are more uniform in age, and the pleura is much less affected. The abomasal and bowel lesions may be quite as well marked as in the paralytic form, but are generally not so severe. This is the form described by Mr. Bowhill as pasteurella bovis, and known along the coast as blood-lung or imapunga. Quite recently it has been described by Mr. Robertson as pneumo-enteritis, or pasteurella bovis. The symptoms manifested during life are those of congestion of the lungs; paralysis does not appear until the animal is *in extremis*. I can form no opinion as to why the thoracic form should be the more prevalent on the coast and the paralytic form the usual one here. It may be that in this area the altitude, diminished rainfall and severity of the frosts in winter make the germ less virulent here. It is the form most commonly reproduced by intravenous inoculation with cultures of the organism, and cases of this type occurring through natural infection are the most violent and fatal.

In touching briefly upon the above forms of pasteurellosis, my object has been simply to associate them with the next one, which by so many of our farmers is considered something entirely apart, a different disease, in fact, to that found along the coast.

The Paralytic Form.

As already explained, my work here has been almost wholly concerned with the paralytic form, and consequently I shall describe it more fully, though I consider it less formidable and in some respects less important than the thoracic or coastal form. The paralytic form varies greatly in its severity. For convenience it may be divided into acute and chronic.

Symptoms. The Acute Form.—Even in the acute form the symptoms may come on rather slowly, and at first may be unnoticed. Sometimes the first warning is a cessation or great diminution of the milk supply in cows. In other cases the milk is secreted even after all the symptoms are advanced and typical; the amount, however, is probably much reduced. Should the stoppage of the milk warn one, and the cow be examined, her temperature, pulse, respiration and excretions are probably quite normal, and no sign of disease is manifest until the stiffness of the gait comes on. Again, I have seen acute cases, with rapidly developing stiffness and inability to walk more than a few yards without lying down, show no other signs of discomfort, and rumination

go on for some time as if in health. The acute cases are all fatal, and the earlier the animal goes down the shorter is the attack. In those peracute cases in which the animal dies within twenty-four hours to three days, the onset of the symptoms is very rapid. These are stiffness (described later), loss of appetite, cessation of rumination, depression of the body temperature, stupor, grinding of the teeth, salivation, frequently eructations and swallowing movements and paralysis manifested by the animal going down within a few hours and refusing to rise again. If lifted it will simply hang in a sling and refuse to support its weight. Sensibility of the skin is not lost, and both hind and fore legs can be moved at will, though incapable of bearing weight.

From the commencement of the attack the temperature falls gradually from normal to 90° F., or even below this; shortly before death it sometimes cannot be registered on the ordinary clinical thermometer. There frequently is considerable excitability at the onset of an attack, but later a sort of stupor ensues in which the animal takes no notice of surrounding objects, and shows signs of headache by frequently shifting the position of the head and an inclination to tuck it round into the flank or pillow it on any convenient support. The respiration and pulse are accelerated only during the period of excitability, and in those cases in which the lungs afterwards show the more extensive disease changes. In some cases the bowels appear relaxed at first, but later the passage of fæces is in abeyance, yet no real constipation exists. In the same way the urine, which always looks normal, may not be voided for long intervals. The sinking of the temperature is manifested by coldness of the skin of the body and limbs, and frequently the coat stares. The animal dies poisoned by the toxins produced by the specific microbes. In the cases which survive, the first three days the animal remains in *decubitus*, and may sit up as if in health, but rumination is suspended, appetite for food practically gone, prehension, mastication and deglutition performed with great difficulty, the animal maintains a sour and indifferent attitude to all one's ministrations, and death ensues sooner or later from exhaustion.

Although the acute form is generally fatal in from twenty-four hours to three days, it sometimes does not terminate in death until as late as the seventh to ninth days. These latter cases do not differ on *post mortem* from the more acute, and there is no real difference. The animal remains in a state of more or less complete stupor during the whole time, and though it may sit up fairly well, and even resent human interference, still there appears to be little return of appetite and small power to masticate or swallow the food. It is this loss of function in the prehensile power of the tongue and muscles of mastication which so completely destroys the chances of such animals recovering. To look at them one would say that given a little time, nursing and good food, their strength would return and the paralysis be overcome. In none of my cases has this happened, a little forage or lucerne pushed into the mouth would frequently remain for hours in the same position, the animal making slow chewing movements and futile attempts with its tongue to draw the wisp completely into its mouth. Some of the animals would drink fairly well, although slowly, and these received milk, gruel, bran and slops, but only a very little of

such food was partaken of. When we attempted to drench with such fluids, swallowing difficulties were soon manifested, and the *post-mortem* lesions in the lungs showed that portions of the drench had been inhaled, and that our attentions had only aggravated the poor animal's sad plight. The few cases which did manage to swallow ate so little and in such a half-hearted manner that they could get no good of the food even if it were digested, which it certainly was not. I am aware that cattle do occasionally recover and get up after lying for weeks, but the only case we have had here which did so I prefer to place amongst the chronic cases, inasmuch as prehension, mastication, deglutition and rumination were never in any way impaired.

The chronic form, which we have met with here, has manifested itself also with different degrees of intensity. Some cases showed only slight stiffness during progression, nearly always most manifest in the forequarters. These cases would last a few days only, and leave the animal apparently little the worse. In more severe cases the gait was characteristic, whilst the knees seemed closer together, as if hobbled, the feet would be thrown forward and outward with a laboured movement faintly suggestive of the goose step. Viewed from the side the knees were very hollow in front (" calf-kneed "), and there was a sinking of the forequarters from side to side when the weight was placed on each limb. The movements of the hind legs were much less noticeable, but sometimes there was a very slight arching of the back, and the feet were thrown well forward similar to a case of founder in the horse. Others showed slight crossing or plaiting of the hind legs, with a tendency to draw the feet a little backwards before planting them on the ground during progression. A calf which took sick when nine days old showed more stiffness in the hind than in the fore quarters. In the mildest cases the time limits of the attacks were hard to fix, the animals making a gradual return to health. Some were stiff for a week only, others for more than a month, and these lost condition greatly. One went down on the thirteenth day, was lifted daily with slings, and finally got up and made a gradual recovery after being down twelve days. Such severe cases, even when recovered and putting on condition, do not always regain their wonted freedom of movement, and can be picked out from the herd for a long time afterwards by the peculiarity of their gait.

Post-mortem Lesions.—If the carcase be skinned off soon after death there is seldom any subcutaneous extravasation, but an injection of the blood-vessels is often noticeable.

The lungs are sometimes quite healthy, but generally there is considerable congestion of both with a few patches of early hepatization in the lower lobes, and there may be a few infarcts. Where the lungs are congested there is often a little straw-coloured watery effusion in the chest cavity, and frequently also a lymphy œdema present in the mediastinal spaces. The posterior mediastinal and other lymph glands of the chest are always more or less enlarged, œdematous, inflamed or hæmorrhagic, their condition being generally in sympathy with the state of the lungs themselves. The thymus gland is sometimes dotted all over with tiny blood spots under its pleural covering. Of course, from the above remarks I exclude all cases in which lesions have been produced in the lungs through careless or

inconsiderate drenching at a time when paralysis of the muscles of deglutition made such a proceeding quite indefensible.

The heart will be found dilated and its cavities full of softly clotted blood. They are generally petechiac externally, especially along the interventricular grooves, and internally under the endocardium of both ventricles, but more especially the left. Sometimes these hæmorrhages are only external, sometimes only internal to the heart. The heart sac is usually normal, but may be inflamed and contain a little watery effusion.

There is frequently a little yellow-watery fluid in the abdominal cavity, it may be slightly blood-stained, but in my cases has never been abundant, and the peritoneum looks normal. The paunch and reticulum are healthy, in one or two cases only have I noticed congestion of the papillæ after scraping off the epithelium. Small splinters of bone are constantly found amongst the contents of the paunch. The manyplies is also normal as a rule, though in some cases I have seen the leaves injected in places. In many cases, which have always had plenty of water supplied to them during illness and generally a purgative drench given at the outset, there has been no impaction of the stomach, and I can hardly believe that such a lesion is common in this disease, but incline to think that where present it is due to the cattle having gone down far from water and died without being supplied with it. Many farmers also do not clearly understand the difference between the normal dry state of this stomach's contents and impaction proper. The abomasum or fourth stomach, on the other hand, is almost invariably inflamed, sometimes very severely, its mucous membrane a little swollen and showing erosions or early ulceration chiefly along the free margin of its folds. In my cases the pylorus has been usually less inflamed than the body (fundus) of the stomach.

The small bowels are more or less inflamed throughout, their mucous membrane swollen and much catarrhal mucus in their canal. Zebra stripings are frequent, Peyer's patches may be, but are not always, prominent. In the most severe cases hæmorrhages take place into the bowel wall, and the ingesta are blood-stained, but less extensively than in anthrax. There is often a high congested and varicose state of the mesenteric blood-vessels with bleeding into and staining of the fat. It will thus be seen that the lesions of paralytic lamziekte are mainly those of an acute gastro-enteritis. The cæcum, colon and rectum are more or less inflamed, but in my cases always much less severely than the small bowel and fourth stomach. The lymph glands of the abdominal cavity, and especially those situated in the mesenteries, are almost invariably hæmorrhagic, inflamed, œdematous and swollen, their condition corresponding with that portion of the bowel which they serve.

The spleen is more often normal than not, but may be a little swollen and the pulp slightly softened.

The liver is always congested, the gall-bladder is normal or may have the blood vessels of its mucous membrane highly injected, but the bile is clear and normal, even though it fill the bag completely, as indeed it generally does.

The kidneys are congested and very little altered to the eye. They may have hæmorrhages into their cortex, and the apices are sometimes very yellow. The urine looks normal and the bladder also,

but sometimes its mucous membrane is congested or even inflamed in cattle which have been long paralysed.

The muscular system looks unaltered to the naked eye.

The fluid in the spinal cavity is frequently increased in amount, but always clear and watery. The piamater of the brain and pedulla is congested, often acutely, but on the cord this covering is normal even in the lumbar region. The brain and cord look otherwise normal.

The mucous membrane lining the whole nasal of the chambers is frequently acutely congested or inflamed, and of a deep blue or purple colour.

The bones, joints, and marrow look quite healthy, but the cancellated bodies of the vertebræ are often blood-stained.

Susceptibility.—A strange feature about this disease is its incidence of severity upon the female sex. Pregnant cows when near to calving are the greatest sufferers, and the disease in them generally takes on the acute form. Next to these in susceptibility come cows which are giving milk. The disease is less frequent in young growing cattle, and still less in calves and oxen. Still, the latter are susceptible even when drawing transport regularly. A local transport rider told me that during six months in 1906, when his one span of oxen were working almost daily he lost three oxen from lamziekte, whilst a fourth sickened and recovered. Bulls are by many considered naturally insusceptible, but this is not the case. On the coast the thoracic form is very common in young cattle and calves. So far as we know, no breed is exempt or even enjoys comparative immunity from attack.

Plurality of Attacks.—The power of resistance to this disease seems to be greatly impaired by one attack, and perhaps there is good ground for saying that animals once affected do not really recover. Doubtless our experience is rather too limited to allow of our coming to such a hard and fast conclusion, but in this experiment so far such a verdict might be given as regards the control (non-bonefed) animals at least. An exception might be made in the case of the small calf, and possibly that of very young animals generally. In this respect I may mention that I had three two-year-old heifers and a young cow sent to me by the Messrs. Radloff, which up till now have remained healthy. Possibly the change of veld, even of infested veld, may have acted beneficially; all were, however, receiving bonemeal here. Let us examine how our apparently recovered animals are fed.

Ox (property of G. Emslie).—Sick for a few days about December 1, 1906, but did not go down. Sick again on January 8 to 14, 1907, and died. Ox contracted both attacks when pulling in transport wagon, and had been very much in the yoke previous to his attacks.

Ox 6.—Sick here September 15, 1907, down on the 13th day, rose after twelve days, and recovered. Again sick January 31, 1908, went down March 13, and is still down at date of writing (March 17).

Heifer 58.—Sick for five weeks from October 28, 1907; calved November 12 at the height of her illness; did not go down. She picked up nicely again in condition, but her gait was still quite

noticeably amiss when on March 7 she again fell sick, and died on the 11th from an acute attack.

Cow 91.—Sick November 1 to 8, 1907; only mildly stiff. Sick January 3, 1908, and died within twenty-four hours. She had appeared quite recovered in the interval.

Cow 30.—Once sick at Secretaris (Radloff's farm). Sick here December 2, 1907, and died within twenty-four hours.

Ox 76.—Three times sick at Secretaris (Radloff's farm). Sick here April 21 to 25, 1907. Again sick May 17 to 23, 1907, when he died from a fifth attack.

Cow 33.—Sick December 24, 1907, and with slight remissions up to date. Had lost greatly in condition, but recently began to improve in her gait, and put on flesh again.

Ox 95.—Sick for three weeks from January 24, 1908, but only very mildly; appeared recovered, but sickened again on February 25, and died within thirty-six hours.

None of the above animals received any bonemeal whilst in my hands. The other mild cases which appeared to have recovered are too recent to be worthy of inclusion here.

Treatment.—I feel very diffident to waste time by describing treatments, none of which, to my mind, appear to have availed anything. Acute cases die in spite of any drugs given, and chronic cases undoubtedly recover without them—nay, even in spite of them, perhaps. The following is a list of the drugs which have been tried singly or in combination with others: epsom salts, glauber salts, podophyllin, gamboge, calomel, salicylic acid, colchicum, cyllin, sodii hyposulph, arsenic, arrhenal, nux vomica, and also acetic acid (the latter as a substitute for the Boer remedy, vinegar). Besides these, artificial serum, normal serum and weak iodine solutions have been given hypodermically. Perhaps the best and most reasonable thing to give is a purgative, for it has a marked action in clearing out germs from the inside of an intestinal canal. The best advice I can offer is: "Don't kill your animal by treatment; never give a drench to an animal incapable of swallowing it; bed your paralysed cow down comfortably; prop her up with sacks filled with earth; lift her frequently, and make her change sides two or three times daily. Give her lucerne or green barley if she will eat it, and plenty of water to drink. Pin your faith on methods of prevention, and you will save time, worry, and cattle enough to recoup yourself amply for all the expense entailed."

Seeing that the flesh is not harmful, I think that the "baas" might very judiciously at times cut the throat of those cases which from the outset look certain to be fatal, and so make the best salvage upon a fat cow which otherwise is but a free gift to the natives.

I would strongly recommend also that all recovered (?) cases be fattened off and sold, for there is no doubt that such animals are very prone to further attacks. Possibly also through course of time this weeding out of the most susceptible cattle would cause the herd to become gradually more resistant.

Prevention.—Convinced as I am that the complaint known here as lamziekte is not a bone disease, it seems strange that we should turn to the administration of sterilized bonemeal in the form of a lick as our

foremost and best tried means of prevention. As already mentioned, cattle well supplied with this lick scarcely manifest any depravity of appetite, but, more remarkable still, they do not contract lamziekte in anything like the same proportion of cases, and probably also with less severity when they do (but here my experience is too brief to warrant any dogmatic assertion on the last point). Empiric practice by supplying an apparent want has found a preventive remedy, but it is left for science to solve the enigma of just how it acts. Bonemeal is evidently a good tonic, its phosphates are a necessity to the food ration, and should these be proven deficient in the grasses and bush of the varied areas in which this disease abounds, the benefits accruing from its administration will be further explained in the results, which are that the stock are thus kept in a state of exuberant health. Further explanation than this I am at present unable to give. The method has its drawbacks, chiefest of which is the expense entailed, and, looking at it theoretically, I fear there is a wastage, and hope that some day the one thing needful which seems to be contained in the bonemeal will be separated from the vast bulk of matter, and made capable of administration in a cheaper and even more convenient form. Meanwhile there is always the hope that bacteriology may come to the rescue, as it has done in so many other specific diseases of late.

Bonemeal fails in another great respect, it does not remove the cause. To this end there are other methods which suggest themselves for prevention, and which, if tried thoroughly, may in time be even more successful. I refer to the possibility of avoiding all contamination of dams, wells, and boreholes by fencing them in, and running the water into troughs for the supply of the farm stock. These troughs would, of course, have to be thoroughly cleansed at intervals.

I believe that dipping of the cattle has so far given no indication of efficacy in checking the ravages of this disease in the coostal districts.

Changing of the grazing area, the time-honoured custom of prevention in former days, becomes less and less possible as the country becomes more settled; it is also one of the most prolific means of spreading germ infections, and has done incalculable harm in the past. Most farmers are agreed that during the late war the movements of stock and trek oxen more especially were responsible for the infection of many hitherto clean farms in this area. One farmer, writing to me, says that his farm was clean until he lent grazing to a neighbour's badly infected herd, with the result that the infected herd benefited at once by the change of veld, and left off dying, whilst his own cattle began to die off at the rate of four or five a day for a time.

Although the flesh may be eaten with impunity, I strongly recommend destruction of the viscera and all ingesta and excreta, preferably by fire.

Investigation Work.

Although I knew that a good deal of experimental work had been done already with this disease, I thought it best upon my arrival here to proceed with this part of the investigation just as if I were working with a new complaint about which nothing was known. As nearly all of my cases of lamziekte assumed the paralytic form, this procedure seemed all the more justifiable. Experiments were undertaken, therefore, on many different lines, such as (1) drenching, (2) inoculation,

both being performed with (*a*) materials obtained from the dead animals and (*b*) artificial cultures, the last being by far the most important and successful work accomplished. Let us first consider

Drenching.—(*a*) With Ingesta (pens mest).—Several goats were drenched with the fluid contents of the paunch, fourth stomach, small bowel or cæcum, or even with scrapings of the mucous linings of these organs, but all remained apparently unaffected.

(*b*) With Blood.—Three goats were drenched each with from 12 to 16 oz. of fresh blood from three different sick cattle, with no result so far as could be seen.

(*c*) With Marrow.—One goat received 6 oz. from the humerus of a sick ox. This goat developed a fever reaction from the fourth to the eleventh days, which had probably nothing to do with the drenching.

(*d*) With Artificial Cultures.—One goat received by the mouth 70 cc. of an eight days old nearly pure broth culture of the pasteurella, and on the following day 55 cc. of a similar culture eleven days old, without developing any consequent sickness.

Inoculation with Body Fluids.—(*a*) Blood.—Taken from sick cattle and injected in huge quantities into both cattle and goats, either under the skin or into the vein, proved harmless. Two control cattle (*i.e.*, those receiving no bonemeal) were used as the subjects of these experiments. Long afterwards both these cattle contracted lamziekte from the natural infection. A guinea-pig also resisted blood inoculation.

(*b*) Lymph Gland emulsion or expressed fluid proved innocuous; it was used upon six goats from four different sick animals. In my hands also it has so far failed to kill guinea-pigs by intraperitoneal injection.

(*c*) Spinal Fluid.—Was injected into the vein of a cow, a goat, and a sheep without result.

(*d*) Peritoneal Effusion.—A dose of 10 cc. fresh and warm injected into the vein of a goat proved negative.

Inoculation with Artificial Cultures.—As already stated, the motile bipolar organism has been recovered from the tissues of all our later cases. Very frequently it cannot be picked up from the lymphatic glands of the chest or abdomen, but so far I have never failed to cultivate it from the submucosa of the abomasum, small or large bowel. From such sites the resultant cultures are generally very much mixed. The following cases have yielded cultures of this organism, Emslie's Ox, Nos. 56, 76, 9, 62, 62's calf, 91, and 105. Our initial failures can easily be accounted for by errors of technique and want of knowledge of the habitat of the organism within the animal system. Having once recovered the organism and brought it to purity, it is an easy matter to keep hold of the strain and pass it through the different experimental animals. In our hands it has proved virulent for an ox, goats, sheep, guinea-pigs, and a rabbit. It has generally been used intravenously, but in increased doses will kill also by an injection under the skin. Old cultures contain a very virulent toxin, which upon injection produces the same train of symptoms as the live organism. These experiments are much too numerous to detail, but two sample cases will be given by way of elucidation. It will be seen that the paralytic type of the disease has not been reproduced by inoculation, but that the *post-mortem* lesions in these cases resemble

very closely the thoracic and gastro-enteric forms as seen more particularly in the coastal districts.

Ox No. 76 died from his fifth attack of lamziekte on May 23, 1907, after an illness lasting seven days. A nearly pure culture of the motile bipolar organism was obtained direct from one of its mesenteric glands, and at six days 4 cc. of this broth was injected into goat No. 18 at 6 p.m. Next morning the goat was found dead; it had lived only eleven hours. The autopsy was held at once, and revealed watery effusions in the chest, heart sac, and abdomen, congestion, emphysema, and marked interlobular œdema in both lungs, lymphy jelly in the mediastinal spaces and around the heart sac, acute inflammation of the fourth stomach, with small incipient ulcers at the pylorus; small bowels congested or patchily inflamed; large bowels even more so. All the lymphatic glands enlarged, inflamed, and œdematous. Liver and kidneys congested, spleen small. Pia-mater of brain congested; mucous lining of the nasal chambers of a deep purple-red colour.

Four months afterwards, when this strain of virus had been passed successively through three guinea-pigs, a rabbit, a goat, and another guinea-pig, it was injected in the dose of 100 cc. into the vein of Ox No. 80, and produced his death in three and a half days. The injection was made at 6.15 p.m., and although the culture was only seven days old, the very depressing and powerful nature of its toxine was soon evident. At 11 p.m. his temperature had fallen from 103·2° F. at the time of injection to 95·8° F.; he showed marked rigors, and stood with his back arched and a dull expression, his movements were all over stiff, the surface of the body cold, and there was frequent passage of very fluid fæces. Next day he was very dull and stiff, refused all food, purging continued till noon, and thereafter slimy mucus streaked with blood was passed, he salivated a little, and passed blood with his urine. The body temperature ranged between 98·4° to 101·2° F. Next day he looked much worse, and showed respiratory trouble, ate nothing, passed no fæces, temperature 96·4° a.m., 101° p.m., very much depressed all day. On the third day the symptoms of pneumonia, depression, and debility became more and more pronounced; he lay a great deal, but could rise when wanted. He died at 8 a.m. on the fourth day, after struggling for some time on one side. The necropsy revealed the following lesions: There was much extravasation and injection of blood-vessels under skin. A little effusion in heart sac, heart externally showed a few roughened patches of early pericarditis, fat stained red and a few ecchymoses, left ventricular endocardium was one mass of deep blue-black ecchymoses, right showed a few at its apex only, blood fluid in all its varieties. Chest contained at least a pint of straw-coloured effusion on each side, lungs showed much interlobular œdema and emphysema also in places. The lower lobes especially were pneumonic, not all of same red colour and consistency. There was much blood extravasation under the pleura, especially in upper parts of lung, tracheal mucous membrane red and inflamed. Lymphatic glands of chest swollen, inflamed, and œdematous. Spleen, liver, and kidneys little altered. Only a little effusion in abdomen. First three stomachs normal, fourth inflamed, its mucous membrane swollen, red or bluish-red in colour, and with one incipient ulcer. Small bowel acutely inflamed, its mucous membrane a little swollen, and all blood-vessels injected, large bowel much less so, and worst at cæcum. Mesenteries

injected and blood-stained, all lymphatic glands swollen, œdematous, inflamed and pinkish in colour. Spinal fluid much increased, spouted briskly when tapped, cord normal throughout, but inner covering of brain highly injected, and ventricles full of fluid. The lining membrane of the nasal chambers was bluish-red and congested, mouth and throat normal. Bones, marrow, and joints normal.

Many other strains of virus have been tested by means of experimental inoculations into goats and sheep, death ensuing more or less rapidly, according to the age and purity of the cultures used. The *post-mortem* appearances are almost identical with the two above described, and vary a little only according as the germ exerts its virulence, mostly upon the thoracic or upon the abdominal viscera. The micro-organism is readily picked up again from their tissues, and maintains its virulence for fresh animals.

Reviews.

INVESTIGATIONS INTO THE NATURE AND CONTROL OF SWINE FEVER. By Professor Dr. Uhlenhuth, Dr. Xylander, Dr. Hübener, and Dr. Bolitz.

This book, published by Julius Springer, of Berlin, contains a very wide and exhaustive record of experiments conducted by the above-named gentlemen with a view to discovering the origin and method of control of swine pest.

The clinical appearances and pathological anatomy of the disease are fully described, and experiments with serum and a filterable virus are lucidly given, with all the detail dear to science. The conclusions the authors come to are that—

(1) German swine-pest, like American hog cholera, may be traced to a filterable, ultra-visible agent. Injections of material (serum, blood, organ extract) of animals having swine pest, filtered through Berkefeld or Heim filters, and bacteria free, caused a similar illness to swine pest, and often a fatal result. The clinical and pathological-anatomical appearances were the same. Inoculations had no influence on the incubation period and severity of the illness. The illness depends on the presence of a specific active virus.

(2) Inoculations with the filtrate showed that the illness is contagious. Healthy animals placed with inoculated animals fell ill of the disease.

(3) Animals that withstood artificial infection are immune against natural and artificial infection. Animals naturally infected are immune.

(4) The inoculation of culture filtrate of *Bacillus suipestifer*, or of the filtrate of the serum, or organ extract of healthy swine, could not produce the illness.

(5) The *B. suipestifer* is a saprophyte occurring in the intestines of healthy swine, and is not the cause of swine pest. It was found fifty-one times in the intestinal contents of 600 healthy swine.

(6) It is very frequently met with in the organs of animals ill of swine pest, and was found seventy-six times in 171 cases.

(7) Pigs treated with *B. suipestifer* were not immune against artificial infection with swine pest virus.

(8) The infection of swine pest occurs under natural conditions, most probably and most frequently *per os.* In the spread of the disease, contact infection plays the chief *rôle.* Feeding with virus-containing material causes sure infection.

(9) The virus occurs in the blood and blood-supplied organs, in the gall and urine. The urine is highly infectious.

(10) The virus may be preserved ten weeks at room temperature, and twenty-three days in an ice cupboard.

(11) The serum of swine which withstood swine pest (and inoculated with great quantities of virus-containing material) showed a great protective power.

(12) Animals inoculated with the serum, before becoming diseased, were protected.

The book is issued in paper covers. As a contribution to the science of the disease it ought to be bound in something more lasting.

G. M.

REPORT OF THE FOURTEENTH INTERNATIONAL CONGRESS FOR HYGIENE AND DEMOGRAPHY.

With the completion of the official Congress Report, comprising four volumes, the work of the Fourteenth International Congress for Hygiene and Demography, Berlin, 1907, is concluded. The two last volumes will be sent to the members of the Congress in the course of this month.

The entire report has been published by August Hirschwald, Berlin, and can be bought at the booksellers for the price of m. 50. The volumes are also to be had singly at the following prices: Volume I, 6 m., Volume II, 14 m., Volume III, Part 1, 10 m., Volume III., Part 2. 10 m., Volume IV., 10 m.

CATALOGUE OF LEWIS'S MEDICAL AND SCIENTIFIC LIBRARY. New edition, revised to end of 1907. H. K. Lewis, 136, Gower Street, London, W.C. 1908. Pp. 500. Size, demy 8vo. Price to subscribers 2s. net, non-subscribers 5s. net.

This catalogue shows that the library whose books it enumerates, comprises one of the best collections of up-to-date books of all branches of science. All professional men should keep themselves in touch with the current literature bearing on their work, and as it is quite out of the question for the average practitioner to think of buying all the new books, he could make up for it by at least borrowing some through such an agency as this. A guinea a year entitles the subscriber to one volume at a time, or thirty shillings to two volumes, and so on.

Some veterinary surgeons have been deploring the non-existence, as they thought, of a circulating Veterinary Library. We find nearly all the best works relating to veterinary science in the list, including medicine, surgery, hygiene, pathology, physiology, anatomy, and meat inspection. We believe that most members of the veterinary profession would feel well repaid by joining this library.

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

THE following is the result of the Election of Council which took place in June, 1908:—

*†Sir John M'Fadyean ...	1,122	*†Major-General Thomson ...	854
*†Mr. Jas. Simpson	995	*Mr. R. Rutherford	725
*†Prof. Dewar	936	†Mr. H. Hunter	677
*†Mr. R. C. Trigger	901	Mr. J. W. M'Intosh ...	638
*†Mr. S. Villar	882	Mr. R. Roberts	608
*†Mr. F. Garnett	875		

There were 8 vacancies. Marked thus * elected. Marked thus † retiring members eligible for re-election.

There were 140 papers received after the seventh day prior to the election, which were therefore not examined.

PERSONAL.

THE honorary degree of Doctor of Science has been conferred by the University of Durham upon Mr. Clement Stephenson, F.R.C.V.S., of Newcastle-on-Tyne.

THE NINTH INTERNATIONAL VETERINARY CONGRESS AT THE HAGUE, SEPTEMBER, 1909.

(Under the high patronage of His Royal Highness Prince Henry of the Netherlands, Duke of Mecklenburg.)

A.—HONORARY COMMITTEE.

President: His Excellency the Minister of Agriculture, Industry and Commerce.

Vice-Presidents: Their Excellencies the Ministers of Foreign Affairs, of the Interior, of War and of the Colonies; Their Excellencies the Extraordinary Envoys and Plenipotentiary Ministers of Belgium, China, France, Germany, Great Britain, Italy, Japan, Persia, Portugal, Roumania, Turkey, and the United States of America, at The Hague; the Messenger of the Holy Seat at The Hague; the President of the Second Chamber of the States-General; the General Director of Agriculture at The Hague; the Director of Agriculture at Buitenzorg (Java).

Members: The Governors of the provinces of Southern Holland and of Utrecht; Professors Dr. C. A. Pekelharing and Dr. H. Zwaardemaker at Utrecht, Dr. W. Nolen at Leyden, Dr. H. J. Hamburger at Groningen, Dr. C. H. Kuhn at Amsterdam, and Dr. T. H. MacGillavry at The Hague; Dr. C. Roest, Deputy General Director of Agriculture at The Hague; the Mayors of The Hague and of Utrecht: the Director of the State Veterinary School; Mr. P. B. J. Ferf, Member of the Second Chamber of the States-General; the President of the Netherland Committee of Agriculture; the Presi-

dent of the Central Sanitary Council; the Chief Inspectors of Public Health at The Hague and at Bush.

N.B.—The Plenipotentiaries of the Austro-Hungarian, Russian and Spanish Legations at The Hague have not as yet definitely answered to the invitation to accept the Vice-Presidency of the Honorary Committee.

B.—Committee of Organization.

The Professors of the State Veterinary School at Utrecht; the Director of the Sero-Therapeutical Institute of the State at Rotterdam; the Lieutenant-Colonel, Chief Military Veterinarian at The Hague; the district veterinarians at Haarlem, Leeuwarden, and Roermond; the Director-in-Chief of the Government Export Meat Inspection Service at The Hague; the Directors of the Slaughterhouses of Amsterdam, Rotterdam and Leyden; the President of the Subcommission A, indicated in Article 4 of the horsebreeding law: the President and First Secretary of the Veterinary Society of the Netherlands; the Presidents and Secretaries of all the sections of the same Society; the President and the Secretary of the Hygienical Veterinary Association; the former and the present Inspector of the Civil Veterinary Service of the Dutch East Indies; the Major, Chief Military Veterinarian at Batavia (Java).

C.—Executive Committee.

President: Professor W. C. Schimmel, of the State Veterinary School, Member of the Permanent Commission for the International Veterinary Congresses at Utrecht.

Vice-Presidents: Professor M. G. de Bruin, of the State Veterinary School at Utrecht; M. J. Hengeveld, District Veterinarian at Haarlem; Dr. J. Poels, Director of the Sero-Therapeutical Institute of the State at Rotterdam.

General Treasurer: Professor D. F. van Esveld, of the State Veterinary School at Utrecht.

General Secretary: Dr. D. A. de Jong, Director of the Public Slaughterhouse, Member of the Permanent Commission for the International Veterinary Congresses at Leyden.

Second Secretaries: Dr. H. Remmelts, Director-in-chief of the Government Export Meat Inspection Service at The Hague; Professor Dr. H. Markus, of the State Veterinary School at Utrecht.

Members: Lieutenant-Colonel A. Overbosch, Chief Military Veterinarian at The Hague; H. M. Kroon, President of the Veterinary Society of the Netherlands at Deventer; Professor J. J. Wester, of the State Veterinary School at Utrecht; Inspector C. A. Penning, of the Civil Veterinary Service of the Dutch East Indies at Buitenzorg (Java).

D.—Office.

President: The President of the Executive Committee.

Secretary: Second Secretary Dr. H. Markus, of the Executive Committee.

Members: The General Treasurer and the General Secretary of the Executive Committee.

The Executive Committee has the honour to make the following statements:—

(1) By reason of the International *Medical* Congress at *Budapest*, which will also take place in 1909, the exact date of the Veterinary Congress will be published afterwards.

(2) Information may be obtained from:—

Dr. D. A. de Jong, General Secretary of the Executive Committee at Leyden; Dr. H. Remmelts, Second Secretary of the Executive Committee at The Hague; and Dr. H. Markus, Second Secretary of the Executive Committee at Utrecht.

(3) Further details concerning the organization of the Congress will be communicated as soon as possible after they are stipulated in agreement with the permanent commission for the International Veterinary Congresses.

(4) The Executive Committee has asked the members of the permanent commission to form *national committees* in their respective countries, in order to contribute to the success of the Congress at The Hague.

(5) The Executive Committee entered into correspondence with the direction of the Society of the Sea-baths of *Scheveningen*, in order that the members of the Congress should be able to profit during their stay in Holland as much as possible of this pleasant seaside resort.

In the name of the Executive Committee,

W. C. Schimmel, *President.*

D. A. de Jong, *General Secretary.*

Translations and Extracts.

CATTLE POISONING THROUGH EATING TANSY (*TANACETUM VULGARE*).

BY WESSEL, WILSTER, AND DR. BUGGE, PRINCIPAL OF THE ANIMAL DISEASES INSTITUTE OF THE CHAMBER OF AGRICULTURE FOR SCHLESWIG-HOLSTEIN.

On a highland pasture a farmer found (on June 2, at half-past eight in the morning) three young cattle dead, and a fourth in a serious state. The latter showed marked dulness, staggering gait, and great weakness. She soon fell down, making champing movements of the jaws, and foaming from the mouth. Besides these animals, there were eight others in the meadow. They were immediately removed on to another meadow. Another animal was taken ill on June 3. It recovered after four days on the changed pasture.

Post mortem revealed no special changes in the internal organs. The contents of the rumen were sent to the institute for examination.

Chemical and bacteriological examination revealed nothing of note, and a botanical explanation was sought; all plants from the meadow were asked for, but an examination of a great number gave none poisonous. The animals were therefore put back in the meadow, and on July 12 another one fell ill.

Symptoms.—Food refused, dung hard, dark, dry, and covered with

slime; chewing at times, rumination slow. Whilst masticating the animal ceased without apparent cause, frequently dropping grass from the mouth. The owner truthfully remarked that she looked like a horse with staggers. Sensorium greatly affected. Animal took no notice of her surroundings, nor of man's voice, and the head was held down. She made shaking movements with her head and neck. Pulse strong, 64. Temperature 38·6° C. Eyelids half closed. When driven the animal blundered into trees and waggons and the wall of the shed, and could not find the door. Pupils contracted, and globe of the eye flickering. These movements very pronounced if anybody went near or took hold of the beast.

The Meadow.—At its boundaries and near the hedges Bugge found a large quantity of tansies; many in the meadow had been bitten off, and as far through the hedges as they could be reached these plants had been eaten. Kobert says the ethereal oil found in tansy is peculiar to several plants in no way related botanically:—

(1) Arbor vitæ, *Thuja occidentalis* (*Coniferæ*).
(2) Tansy, *Tanacetum vulgare* (*Compositæ*).
(3) Wormwood, *Artemisia absinthium* (*Compositæ*).
(4) Sage, *Salvia officinalis* (*Saliatæ*).

Thujon, or tanacetum, CHO, producing abortion and phosphoric fattening, occurs in the oil, and may cause rupture or inflammation of the stomach. Jürg says it paralyses brain centres, and in large doses causes general paralysis. On the blood thuja exerts hæmolytic, agglutinizing, precipitating, and methæmoglobin-forming effects.

On submitting the whole matter to Dr. Kobert, of Rostock, at whose institute several investigations on poisoning by tansy have been conducted, he wrote us that he had not the slightest doubt that the animals had died from tanacetum or thujon poisoning.—G. M.

(*Berliner T. W.*)

A CASE OF PERSISTENT LACTATION IN A MULE.

BY J. F. DEVINE, D. V. S., GOSHEN, NEW YORK.

In the October number of the *Review*, 1907, Dr. L. Friedhiem, of Fair Hill, S. C., tells us of a mule giving a continuous flow of milk. Since then I have had under observation a large, valuable mule that has been milking for the past year, giving from four to six quarts morning and evening; it was at first interesting, but now has become an annoyance, as the owner has appealed to me to suppress the flow. The ordinary remedies, camphorated oil, &c., have been of no avail, and if any member of the profession wishes to incur my everlasting gratitude, he may do so by suggesting an efficient remedy. I hope my request will be taken seriously and that I shall hear from some good-spirited brother.

(*American Veterinary Review*).

New Instruments.

NEW PARTURITION FORCEPS FOR BITCHES AND CATS.

The advantages in this instrument are very great, and, in my opinion, will meet long-felt requirements in difficult cases of parturition in the bitch and cat.

The new forceps may be used in very small toy bitches and cats to bring along the head. In larger breeds, say bull bitches, they may be

used in grasping the bulging portion of the puppy's limb, the hock, the elbow or the wrist. When locked they get a good grip; they are not likely to break the skin, or to do any other irreparable damage to the puppy. The unusual length of forceps allows of a long, safe reach in operating.

George Simpson, M.R.C.V.S., Leeds.

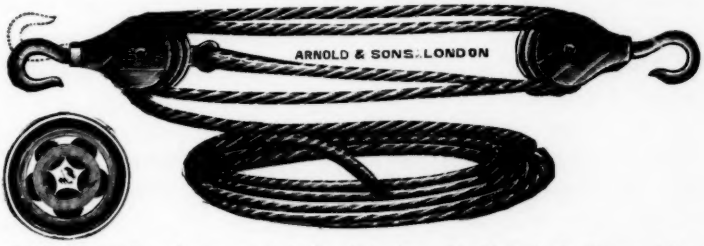
The makers are Messers. Arnold and Sons, West Smithfield, London, E.C.

THE ANTI-FRICTION OBSTETRIC PULLEY BLOCKS.

Introduced by Chas. A. Good, M.R.C.V.S., Newport, Isle of Wight.

These are double pulleys manufactured of forged steel, at one end of which is a swivel hook and a fixed one at the other. They are supplied with forty feet of the finest manilla hemp rope.

The principal feature of these pulleys, however, is the sheave,



which is made of gun metal, the interior of which is built up of a number of rollers of the same metal, exactly on the same principle as the ball bearings of a bicycle wheel, whereby a much greater power is obtained, and a smoothness and evenness of movement quite unknown in any other kind of pulley.

They are exceedingly strong, capable of standing a strain of

upwards of a ton. Notwithstanding their strength and power, they are compact, light and portable, occupying but little space.

After many years experience I have not the slightest hesitation in stating that they are far and away the best obstetric pulleys I have ever seen or used, and I recommend them to the notice of the veterinary profession with the utmost confidence and pleasure.

The makers are Messrs. Arnold and Sons, West Smithfield, London, E.C.

Books and Periodicals, &c., Received.

Lewis's Medical and Scientific Library Catalogue; Journal of the Royal Army Medical Corps; Revista de Medicina Veterinaria; Department of Agriculture, Victoria; Agricultural Journal, Cape of Good Hope; Journal of the Board of Agriculture; L'Hygiène de la Vlande at du lait; Proceedings of the Royal Society of Medicine; Agricultural Journal, Transvaal; United States Department of Agriculture; Friedberger and Fröhner's Veterinary Pathology. Revised Translation by Mr. Hayes (Hurst and Blackett).

Letters and Communications, &c.

Mr. W. Waters; Captain Gamble; Mr. T. Parker; Captain Schofield; Captain Griffith; Mr. G. Mayall; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction; Dr. Nietner; C. W. Townsend.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements), should be addressed to the Editor.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

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